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THE PSYCHIA QUARTE

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TREATMENT OF THE MANIC-DEPRESSIVE PSYCHOSES

BY AUGUST E. WITZEL, M. D.,
DIRECTOR OF CLINICAL PSYCHIATRY, BROOKLYN STATE HOSPITAL

Although the title of this presentation implies treatment of a particular group of psychoses, many of the remarks may be applied to the therapy of any form of mental disorder. The material has been gathered from the writings of various authors, personal observations and endeavors, and was presented as a lecture, in a course of instruction in psychiatry and allied subjects, given to the medical staff of the Brooklyn State Hospital, during 1927-28.

A physician dealing with a person ill with mental disease must appreciate that he is not concerned with a mere case or diagnosis, but with a human being—one who presents certain problems and strivings which distinguish him completely from his fellow men and stamp him an individual. It is only when we ascertain and understand these problems and strivings that we can help the individual to adjust to himself and society.

Psychiatrists in general seem to worship at the "Shrine of Names." Names appear to be something very tangible and definite to them. A diagnosis is sought. This may account for the fact that many case records contain sufficient data to permit one to arrive at a diagnosis—and nothing more. This reminds me of a remark made by Dr. Adolf Meyer, to the effect that on one occasion, a student came to him and said, "Professor, shall I work this case up as a dementia præcox?" Are some of our patients approached with such a preconceived idea in mind? Diagnoses serve useful purposes, such as: ruling out other conditions; standards of comparison; research; statistics; etc. However, one who feels that his obligation has been satified when the patient has been labeled manic-depressive, dementia præcox, general paralysis, or what not, will never appreciate what is going on in the patient. The idea of diagnosis should be set aside for the more important problems of getting the facts, trying to understand why the individual is ill, interpreting his symbolic performances and seeking ways and means of helping him to get well.

There is no specific—no panacea in the treatment of the manic-depressive psychoses. Therapy is of the special problems pre-

sented in the individual patient. This may account for the striking fact that in textbooks very little is given, as to treatment, in comparison to other data. Because, to write the therapy of these reactions would be to give that of each patient. However, some general formulations are presented in this discussion.

One can judge, treat and prescribe effectively only when one is quite sure of what is going on in the patient. We must have a complete whole in view before we can draw any conclusion about its parts. In order to accomplish this, and reach a judgment of therapy, it is essential and of primary importance to make a thorough and exhaustive investigation of the individual's life experience, including what he has derived from his forebears, and a complete examination of his present condition. Facts should be accumulated in regard to: (1) The physical, the intellectual, the economic, the affective, the social and other influences, if any, which may have played a role in the development of his make-up; (2) the use he has made of his personality traits regardless of whether he appears to be an introvert, extrovert, or what not; (3) the morbid process which he is suffering from, and its effects on his personality, that is, one should ascertain and indicate how much remains of the individual's so-called normal personality. How well can one converse with and understand him; how much is he in contact with reality; what are the strivings which indicate his efforts at squaring himself with realiy; (4) the depth of psychosexual regression, and (5) the significant factors in the environment to which he may have to return.

In the examination of the patient, one must have a desire to dig to the bottom of things. This means the utilization of a great deal of time and patience. He should be approached with sympathetic insight, and an attitude which is absolutely impartial and uncritical. Nothing in his remarks or actions should be considered as trivial and unimportant. We must not forget that there is a history back of what he says and does.

When the patient is communicative it is desirable to listen with great care to his own explanation, and not endeavor to correct it. Usually the explanation is a correct one, but it is expressed in terms other than the physician ordinarily employs. If the physician is unable to understand what the patient means, it is pretty cer-

tain the patient will not understand the physician, should he attempt to explain symptoms, etc. If one does not grasp the significance of the situation, it is better to say nothing. Explanations may be offered when the physician knows what to explain. If one is not certain as to what the patient says he should be asked to repeat. One may thus avoid harm to the patient in subsequent therapy.

Leading questions and interruptions should be avoided, unless they are necessary to bring out other data. Interruptions on the part of the physician may prevent the patient giving information which might be useful in the treatment.

Kirby says, "It is usually little important that a patient does or says a certain thing but that he does or says it in a definite setting, gives the act or utterance the value of adquacy or inadequacy of normal or abnormal working." Hence the importance of making accurate clinical observations. I have found it extremely useful to insert in the record, in parentheses, statements relative to the patient's reactions during an interview; or to indicate just what is the environmental situation during a certain act. Such notations give one the setting at a particular time and place and perhaps the stimulus for the act or utterance. These may prove to be leads in the treatment of the individual.

In our medical courses we were taught and trained to make use of our senses—especially sight and hearing. However, I am inclined to believe, that at times, they are sadly neglected, in the observation of our patients. Such reactions as stupor, delirious episodes and other states in which the patient may be inaccessible or noncooperative, should be carefully observed and recorded. The clinical picture is incomplete without them, and adequate therapy cannot be instituted.

Harry Stack Sullivan in his article, "Peculiarity of Thought in Schizophrenia," states, "The ancient predisposition is to expect from the manic-depressive an, at worst, tardy "recovery". As a result, by unwitting complacency, one gets to feel that he need not exercise himself unduly in the therapeutic effort for these patients —as the desired end is guaranteed by the manic-depressive label." Even in this enlightened period of dynamic psychiatry, this feeling is frequently expressed by, "Oh, he's a manic-depressive, he will get well anyway," or, "Well, he is diagnosed dementia præcox, he

can never recover." Do facts justify such an extreme attitude as has been fostered by Kraepelinian psychiatry? Perhaps, to be conservative, one may say that a greater number of patients with manic-depressive psychoses make an adjustment; while, a greater number with dementia præcox do not. However, the diagnosis, per se, does not indicate prognosis or treatment in a particular individual under consideration. It has been the practice in the past—and I regret to say, still is, in some instances, to change the diagnosis from manic-depressive psychosis to dementia præcox, when the patient failed to adjust himself prior to discharge from parole, and on the other hand, from dementia præcox to a manic-depressive psychosis, when the patient made an adjustment in the hospital or on parole, regardless of the fact that the patient could not be made to fit, either clinically or descriptively, the group to which the diagnosis had been changed. According to Pollock, "There is a steady accumulation of patients with this psychosis (manic-depressive) in our State hospitals notwithstanding the fact that the rate of first admissions is not increasing." Two conclusions may be drawn from this statement, namely, that it represents an error in diagnosis, or, some patients do not get well merely because of the label, manic-depressive psychosis. It seems that this accumulation might prove to be a fertile field for research. However, I do not feel that error in diagnosis, alone, will account for the accumulation. From observations, made in our clinics, during the past two years, I am of the opinion that some manic-depressive patients do not get well, and that some of the præcox patients make as good an adjustment as any manic-depressive, but they are not recovered, statistically, because we are still very much in the shadow of Kraepelin, as to the diagnosis and prognosis of these two groups.

To repeat in a different manner the idea that manic-depressive patients get well without treatment, I will quote from White. "There has been the general feeling in years past about this psychosis that the attacks were self-limited. This has probably been dependent to no small extent at least upon the extreme regularity of the attacks in certain patients. These patients, however, are the patients with the more profound constitutional taints, and it is perhaps generally true that in this class of patients attacks do tend to run a regular course, each attack being approximately of the same

duration as the former similar one. With the more frankly reactive types, however, this becomes progressively less true, so that the matter of treatment here easily becomes something more than mere intelligent custodial care."

In the investigation of a number of patients with this psychosis, I have observed, in some instances, that as the patient becomes older the attacks are of longer duration and the interval shorter. This is explained on the basis that each succeeding attack robs the patient of a certain amount of resiliency and come back, due to the repeated insults to the nervous system and advancing years. Also, that although each attack may appear similar to the former one, this is but a superficial resemblance, and a more careful study reveals differences. And, finally, that these repeated attacks may be prevented if one is able to dig to the bottom through the application of analytical principles.

During the past two and a half years it has been my practice to ask our patients, "What helped you to get better?" As a result of the answers given to this question, I am of the opinion, that they do not "just get well," although, in some instances, they may appear to do so. Invariably some rational reason for improvement was advanced, such as: removal of a responsibility which seemed to be overpowering, at the time; removal from aggravating environmental factors, relatives, friends, etc.; the routine life of the hospital; the various social and other activities which the hospital furnishes under guidance and in a systematic manner; seeing and conversing with other patients who impressed them as being much worse than they, thus producing a stimulus to renewed effort to get back in touch with reality; the kindness and sympathetic understanding of physicians, nurses and attendants; the opportunity to pour out their troubles to a physician who was willing to listen and try to understand; the explanation of their difficulties and the good advice received; the continuous baths, even packs in some instances; medication, etc. Many of the reasons given indicated the value of the personal equation in the practice of medicine, especially in the field of psychiatry. On the other hand, some patients mentioned factors which were instrumental in aggravating and prolonging their reactions. For example: a tyrannical, unsympathetic, antagonistic nurse or attendant; the application of packs, restraint, and

even the administration of medicine and vaccines, which in some, produced states of resentment, fear, apprehension, even terror and violent antagonism; being forced to participate in various social, physical and industrial activities, which made no appeal to them at the time, or of which they knew nothing about.

The statement, "I did not know what it meant," or, "It was all so strange and alarming to me," was made so many times, that it is my opinion it does more good than harm, to explain to the patient, the why and wherefore, before instituting any form of therapy, even though it appears that he is inaccessible or does not comprehend. This reminds me of what I have said before, that we should be careful of what we say and do in the presence of our patients, even those apparently inaccessible or in a stuporous state. Nurses, attendants, relatives and friends might be advised as to this. If patients, in such a condition as stupor, comprehend destructive comments and behavior on the part of those in authority, is it not logical, to assume, that even they may comprehend what the nurse or physician, is trying or hopes, to accomplish with the particular therapy, if explanations are offered? Of course, I appreciate that with some patients explanations may make matters worse. However, one learns by trial and error.

I do not wish to emphasize, in this presentation, any form or method of treatment. However, it is quite possible that we are overlooking, and neglecting, to some extent, the physical side of our patients. Primarily we are physicians, then psychiatrists. Unfortunately, some think we are the latter and have forgotten to be the former, in the true sense and fullest meaning. Although we know this is not correct, nevertheless, there is a tendency, unless one guard against it, to think of, and accept, some of the physical complaints of our patients, as neurotic or imaginary. Post-mortem findings may reveal otherwise, to our sorrow. Again, a diagnosis of manic-depressive psychosis, dementia præcox and psychoneurosis, may give one a false sense of security, as these reactions are spoken of as functional—which means nothing, except apparently there is nothing wrong organically. Although no definite relationship has been found to exist between focal infection, internal toxins, endocrine dysfunction, etc., and the manic-depressive psychoses, it is possible and probable that such

existing conditions not only aggravate but prolong the psychotic reaction. We should be on the lookout for factors which may be detrimental to the patient's health, and initiate treatment. It is a wise procedure to listen to and investigate the physical complaints of our patients. A thorough physical examination, and if necessary, repeated examinations, should be made of patients displaying delirium, delirious-like features or stupor.

We have all noted, in our manic-depressive patients, what appeared to be thyroid states, but usually our remarks have been speculative. Repeated basal metabolism tests might reveal and account for some of the reactions observed. We are all aware of, cessation of menses; overcompensatory enlargement of the thyroid, especially in the involution type of reaction; lack of sexual drive, etc., in some of our patients. Various well known and recognized glandular preparations have been used successfully in such and similar states. We should make more use of this form of therapy than we do.

The taking of insufficient food, urinary and fecal retention, should be guarded against, especially in excited and stuporous patients. A frequent check up is necessary. We all know the results of intestinal stasis, and so-called autointoxication, in so-called normals; states of lethargy, headaches, peevishness, irritability, restlessness, etc. Many times patients come to us who have not had a bowel movement in a week, and examination reveals an impacted rectum. A thorough cleaning out of the intestinal tract may produce startling beneficial results. It is quite possible that we neglect, too often, the intestinal tracts of our patients. When fever in a patient seems to be of unknown origin, if the rectum and vagina have not been examined, they should be. Patients have been known to place foreign objects in these regions, with ensuing infection.

Physiotherapy has been used successfully with many patients, although we must often be content with much less than we would like to do, as the patient is uncooperative. Needle and shower baths, the salt rub and the Scotch douche, may be useful for stimulation; also, the Morton wave from static to the spine, and general body treatment with a high frequency electrode and sparks. The ultraviolet light, continuous baths and packs may produce a sedative effect. (More will be said later relative to the baths and packs.)

The static wave over the abdomen, autocondensation, the electric surge bath, and the deep therapy lamp and infra-red heat have been used to promote metabolism. The restlessness and irritability of certain patients may be due to toxic states which may be benefited by resorting to hot air and Turkish baths.

White says, "It must never be lost sight of that during what outwardly appear to be the mildest depressions, suicide is a possibility." Nurses, attendants and relatives should be advised as to this. Careful and unremittent observation and a thorough knowledge of the patient, are the only reliable safeguards. Means of self-injury should be placed out of the way. Sometimes patients may refuse food with suicidal intent. Forced feeding is indicated. It has been my practice to warn relatives, when taking a depressed patient home, as to potential suicide. However, one should advise, not alarm.

During excitement the patient's strength must be conserved as much as possible. It is a wise procedure to first look for the cause of the excitement, without immediately resorting to the use of mechanical, or chemical restraint or packs. However, in some instances, immediate restraint may be imperative; to protect the patient from injuring himself or others; or for medical purposes, as holding bandages, applications, etc., in place. The application of mechanical restraint in the high degree of excitement, is often not understood by the patient and produces an increase of excitement and resistance; perhaps a state of anxious apprehension, and even terror. Thus the intended therapy is defeated.

Excited patients should be kept, as far as possible, from all exciting agencies and contacts. Sometimes complete isolation, in a room with the door unlocked, is desirable, and is not infrequently welcomed by the patient.

It is to be regretted that our physical facilities and personnel, make it necessary, in some instances, to group together patients in packs or restraint. Each one is an exciting and disturbing factor to the other. If they are approached by anyone—an uproar usually follows. Under such conditions, it is quite impossible to interview and get in contact with these patients.

It has been observed, especially with excited and disturbed patients, that symptoms have been accentuated, during or following

visits of relatives. An exception to this is the deeply depressed or stuporous patient. When I was on ward service I always instructed the nurses and attendants to note the effect of various visitors on the patients. If it was observed that a certain visitor had a detrimental effect on a patient, the visitor was seen, explanations offered, and his cooperation requested, by asking him to defer seeing the patient. If objections were raised, they were met by permitting him to view the effects of the visit without being seen by the patient. Invariably, cooperation was then obtained. On the other hand, if a patient appeared to be benefited by seeing the visitor, he was asked to come frequently.

Occasionally, a nurse, attendant or a patient may create a reaction of antagonism, irritability and excitement, in the patients on a ward. Peace and quietness may be brought to the ward by merely removing the disturbing factor. Again, we may have nurses and attendants who have a calming effect on excited patients, and others, who seem to be able to instill in depressed patients, an interest in the environment and themselves, thus assisting them in their return to reality. Also, certain patients may exert similar influences on other patients. On one occasion a young school teacher, adjusting from a manic-depressive excitement, was able to assist the ward physician, in restoring a number of patients to the community. She recognized that much of the behavior of these patients was like that of unruly children in her classroom. She was able to gain their confidence, and transfer it to the physician. We should never fail, in our therapy, to make use of such opportunities.

Although packs have a sedative effect with some patients, with others, they tend to increase the excitement. I believe that if each one of us would submit to the application of a pack and could experience the sensations of some patients while in one, we would not prescribe them so readily. Treatment with them should always be experimental, and if there is evidence that their application is harmful to the patient, they should be dispensed with. They should never be prescribed merely for the convenience, etc., of nurses and attendants.

Continuous baths have been found very useful in manic excitements. I have observed with some patients, that permitting the men to smoke or chew tobacco and the women to chew gum or eat

candy, while in the tub, has added to the sedative effect. Florid manics may become hypomanic while in the bath and this is an opportunity not to be passed by. With some patients I have been able to get a very good content of thought, in this setting. Avoid danger of the patient's collapse, by having an ice cap or cold applications kept on the head. This has been neglected at times.

Chemical restraint is to be avoided, as far as possible, as it tends to shut out reality, thereby increasing the difficulty of adjustment. Hypnotics may be necessary with patients where exhaustion may result. I have found that a powder, containing trional, sulphonal and bromides, grs. 10 of each, given up to three times daily, with or without the addition of a glass of warm milk, has proven useful with some. Again, luminal or the elixir of luminal may bring about beneficial results. Paraldehyde is used frequently but its odor and taste may produce an exaggeration of existing ideas realtive to poison; also relatives are sometimes upset by smelling it on the patient's breath. In some cases of agitated depression, depressed cases of long standing without expressed content, and excited patients with erotic tendencies, bromides in large doses may bring about favorable results. You are referred to Dr. W. W. Wright's article, "Results Obtained by the Intensive Use of Bromides in Functional Psychoses," STATE HOSPITAL QUARTERLY, February, 1925. On the other hand some patients may respond favorably with a much smaller dosage, grs. 10-15 t. i. d., given in conjunction with an intestinal stimulant, such as Tr. nucis vomicae, minims 10, t. i. d.

Requests of our patients should not be passed over indifferently; they should be listened to. If the requests are within reason, some action might be taken. If they cannot be granted the patient should be so advised. Promises easily made by physician or nurse and just as easily broken or forgotten are destructive forces in therapy. If one expects to have and hold the confidence of his patients, one has to gain it—it cannot be done by ignoring patients or forgetting promises. If one's memory is apt to play him false, it is a good principle to make a memorandum of the patient's request—and then, do not forget the memorandum.

Color has been used in the treatment of excited and depressed patients. Favorable results have been reported by isolating excited patients in rooms where the walls, decorations, etc., were blue or

other subdued colors, and keeping depressed patients in rooms in which the color scheme was red or other bright colors. It has been observed that certain excited female patients destroyed dresses of certain colors, for example, red, and assaulted other patients wearing clothing of a similar color. Through experiment it was learned that some of these patients became calm and were more easily cared for, when dresses of a color they liked, were worn. Some depressed female patients were found to respond favorably, that is, became brighter and more cheerful, when wearing dresses of a bright color.

Some hospitals have installed beauty parlors and are reporting good results. The principles of the parlor might be applied throughout the wards, especially with patients displaying narcissistic tendencies.

The foregoing statements relative to color and the beauty parlor may appear to be of minor importance, but with many patients it only takes a simple thing or procedure to start them on the way to adjustment.

Occupational therapy continues to play an important role in the therapy of our patients. However, it should be considered as an auxiliary in treatment—not a "cure all" in itself. If given alone, without individual psychotherapy of the interpretive kind, its true value is not realized. It is easy for a physician casually to prescribe occupational therapy, and then to delude himself that occupational therapy will do the rest. The patient should be continually aided by the physician, through advice and consistent interest, in either his failure or progress at the therapeutic work, and enlightened as to the deeper problems complicating his life. We must not forget that many of our patients have no spontaneous interest in any activity, consequently play or work may have to be suggested. It is not always a good idea for one to suggest what one thinks a patient ought to do along these lines, but what he should do, as ascertained from the facts elicited in the study of his case. A physician may be "sold" on some particular form of activity, and try to sell it to his patients, without being aware of the individual's particular needs. Instead, he should try to find out the patient's interests and the things he enjoys doing, and then with the assistance of the occupational therapist, guide him along the way. Any form of occupation which remains artificial will never make a bridge over to nor-

mal interests. It would seem, unfortunately, that in our endeavors in occupational therapy we are trying to make most of our patients extroverts, regardless of whether they are fundamentally introverted or extroverted. We should study our patients more thoroughly as to their basic mechanisms, and then attempt to put the mechanism to better use. I repeat, here, as elsewhere in the therapy of our patients, treatment, as far as possible, should be of the individual, not of the mass.

When a simple task has produced in a patient a greater capacity for expression of interest, he should be given more work or activities. However, in some cases, like the boy or girl who is far beyond the others in the class in school, is overlooked and kept in this class, our patients are permitted to continue at some activity which long since has ceased to be stimulating. This may enter into hospital economics, but it is not adjusting the patient. Again, when improvement does not occur or is temporary, the cause should be sought. It must not be forgotten that if an excited patient is given work which lends itself to rapid accomplishment, he may be stimulated to efforts which result in increased excitement. Also, patients lacking self-confidence and are self-depreciatory may become easily discouraged and depressed by too difficult tasks, or in competition. Another point in question, we should avoid assigning our patients to activities they are not physically fitted for. Work and the workers are to be fitted to each other.

What has been said of occupational therapy applies equally to physical activities. We should avoid prescribing either in small or large doses, just for the sake of numbers. There is need of close cooperation between physicians and those in charge of these activities, if the best results are to be obtained. It is my opinion, that, we as physicians in the State service know too little about occupational therapy, and as a whole, take but little interest in it.

According to Hoch, the psychological nature of the stupor reaction differentiates its treatment from most of the manic-depressive conditions. He says, "If the stupor reaction be a regression, which is essentially a withdrawal of interest and energy rather than a fixation on a false object, then excitement is desirable and interest must be reawakened. Consequently although trying to those in charge, persistent attention should be given the patient. Feeding and

hygienic measures probably have considerable value in this work. As soon as it is possible the patients should be gotten out of bed and dressed. When up, efforts should be directed towards making them do something, even if it be something as simple as pushing a floor polisher. On account of their lack of interest and enthusiasm, the stupor cases are often omitted from the list of those given occupation and amusement. Even if they go through the motions of work or play with no sign of interest, such exercise should not be allowed to lapse. Then, too, the environment should be changed when practicable. A patient may improve on being moved to another ward or building."

As stated before in most manic-depressive psychoses, visits of relatives have a bad effect, however, the stupor reaction seems to be an exception to this observation. Hoch indicates that a number of patients seemed to begin their adjustment following visits of relatives. Our own observations lead us to agree with Hoch in this. A therapeutic approach is indicated.

Some of the following remarks relative to hypochondria, involution melancholia and the depressive reactions are quotations from MacCurdy.

"Hypochondria fattens on misplaced sympathy. If sympathy is denied the patient feels that his querulousness is justified; if sorrow is expressed for his sufferings, the hypochondria is, so to speak, paying dividends. The secret of treatment is that sympathy be given the patient (who is suffering) but entirely withheld from the symptoms. The complaints should be neglected but not the patient." I am not wholly in accord with MacCurdy in the last statement. It is my opinion that the complaints should be thoroughly investigated, to be sure, as far as possible, that they are without physical foundation. This investigation can be made without letting the patient know we are interested in his complaints.

"Involution melancholics often succeed in having their own way at home by flying into tantrums when crossed, acting very much like the fractious child. In the hospital removal to a disturbed ward, cessation of privileges, etc., may have beneficial results."

Furthermore, MacCurdy points out that the involution melancholic is of the type that becomes easily institutionalized and that the mistake is more apt to be made of retaining him too long, than

of returning him to his normal environment too soon. In their article, "Prognosis of Involution Melancholia," Hoch and MacCurdy pointed out that the type of involution patient that got well, usually completed his adjustment at home rather than in the hospital. This is in marked contrast to the phenomena of adjustment in most cases of manic-depressive depressions, with the exception, perhaps, as indicated before, of the stupors. However, it is my opinion that there should be no set rule as to this. Parole is a therapeutic, as well as an economic measure, and in all mental conditions should be granted or deferred on the findings in the individual case. The home situation, intelligent supervision, and appreciation by the relatives, of the patient's condition, are important factors to be considered, especially, the latter, when a depressed patient is the prospect. Because, as MacCurdy says, "To send a depressed patient back to a family that considered him well, would be, of course, to encourage suicides and other disasters."

According to MacCurdy, "In the depressive reaction, treatment, to be psychologically sound, must aim at either re-establishment of interest or lifting of repression, or, best of all, at both. In all but the severest depressions the state of the patient is better as the day wears on, and this seems to be due to a summation of environmental stimuli that have a cumulatively greater effect. This gives a hint for treatment. The patient should not be allowed to lie abed in the morning; he should be gotten up and dressed. A cold bath often assists in the waking up process. When about, he should not be permitted to sit idly, but should be urged into some activity, even if it be only walking." We are apt to forget these patients, and allow them to sit in a corner, undisturbed. We must not forget that in some of these depressed patients the content of consciousness is often normal except for the pathological affect, and that psychotherapeutic measures may prove effective.

Let us now consider certain psychotherapeutic measures, namely: suggestion, re-education, persuasion and the use of psychoanalytic principles.

The suggestive method rarely, if ever, effects a permanent adjustment. It depends for whatever success may be attributed to it upon the convincingness of the personality of the physician and his ability to win the patient's confidence. Indications are to be sought in

the individual case, therefore, the one suggesting, must know the patient and his problems. In some cases, the patient's faith being strong, a mere statement that the symptoms are quickly disappearing may be sufficient. In others, suggestion with an explanation of the cause of the symptoms and of the best means of combating them is more effective. This, of course, necessitates a knowledge of the cause, based on facts, also, a working understanding of instinctive and emotional forces. If the patient is religiously inclined, however, not using religion merely as a cloak to cover his real difficulties, an appeal may be made through his faith and belief. Religion may be used as a form of sublimation. It is frequently resorted to unconsciously by patients.

Persuasion is a form of suggestion in which the patient is led to take an active part in reasoning himself out of his illness. This is sometimes effective.

In the manic-depressive reactions, as with other mental reactions, we should attempt to understand the nature of the disturbing factors at work, and if possible, the way they have brought about the reaction. An analysis, however, is almost impossible in some patients, particularly during the attack, and can only be resorted to when the patient is, at least, approaching a more normal state, that is, when he has sufficiently emerged from the depression, excitement, etc., to cooperate intelligently. We cannot hope to do a complete analysis of each case: however, by using the free association method, resorting to material already obtained from previous study and observation of the patient, much information may be gained as to the nature of the etiological factors. With such information in our possession we are in a better position to indicate to the patient what he is to avoid in regulating his life in the future, if further attacks are to be prevented. It should be pointed out that psychoanalysis is not a plaything, or, a superficial thing—finding out this and that and producing cures. We have to give mechanisms with cause and effect. Each one of us should have a working knowledge of analytic principles, which can be gained by a thorough reading of the literature. After obtaining this knowledge of the principles, one might work with typical schizophrenic reactions in which mechanisms, trends, symbols, etc., are readily seen and followed, and thus gain experience as to their application.

A physician who has undertaken the examination and study of a patient, provided, he has not developed any antagonisms on the part of the patient, should follow the case through and outline therapy, consulting with others if necessary. There should be no interference by other physicians such as interviews, note taking, change of therapy, etc. Frequently, patients have advised me that they have been annoyed and irritated, by being asked the same questions by a number of physicians. Some patients do not care, others do. Let us try and use good judgment. In emergencies, changes in therapy, etc., may have to be made by others, but as far as possible, the one working with the patient should first be consulted. When it appears that a physician is not obtaining cooperation from a patient, it would seem advisable to turn the case over to another physician.

During convalescence, care should be taken not to force the patient too fast. With some, the previous therapy seems to have been undone by speeding up things in the convalescence period.

Any single form of therapy is scarcely ever adequate. If we fail with one—let us try another. It is suggested, that in addition to the meetings held with the clinical director, the physician in charge of each service meet with the other physicians on the service, from time to time, to discuss their patients, espcially in reference to therapy.

Finally, adjustments begun in the hospital may be brought to completion outside through our clinics and social service department. Although we are obtaining good results, in these fields of therapy, we are not meeting the situation as we would like to. Due to the large and increasing number on parole from the hospital, the increasing number of new out-patients, including children, our contacts with them are brief with relatively long intervals. In many instances the contact takes the form of a very brief continuous note. Just another number. Without doubt we could achieve better results with our manic-depressive patients, who constitute the greatest number of our parole patients, if we could see them more often, and work with them more intensively, at our clinics.

Are we to maintain the purpose for which State hospital clinics were first instituted, namely, to assist our parole patients in making a satisfactory adjustment in their environment; and also

meet, adequately, the situation arising out of the increasing number of borderline cases and children seeking our aid?. If so, changes must be made in our present clinic regime, if we are to practice reconstructive and preventive psychiatry successfully.

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HISTORY OF THE DEVELOPMENT OF SPECIAL INSTITUTIONS FOR EPILEPTICS IN THE UNITED STATES

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From the beginning of public care of the insane in New York State, and elsewhere in the United States, some epileptics were undoubtedly provided for. In 1873 Dr. Ordronaux referred to special provision for the epileptic on Blackwell's Island. In its annual report in 1879 the State Board of Charities observed that: "The subject of providing for the care and treatment of epileptics has long attracted wide attention, but thus far little has been accomplished regarding the matter, either in this or other countries." Beyond a separate ward, no special provision existed, in any institution. The report further mentioned: "That epileptics need intelligent oversight and care, equally with the insane, both on account of their helplessness and dangerous tendencies, is fully and very generally recognized." The Board then called attention to the small percentage of possible recoveries but that proper care would prove wise economy, and referred to hereditary tendencies of the condition.

As to the form of relief advisable, the Board felt that they were not called upon to decide, as wide differences of opinion existed among those familiar with the matter. They concluded: "That great importance of the subject certainly commends it to the thoughtful and earnest consideration of the Legislature."

Dr. Frederick Peterson, while assistant physician at the Hudson River State Hospital, was in charge of a number of epileptics and became specially interested in their treatment. In 1886, he visited the German Colony for Epileptics, located at Bielefeld, of which little, if anything, was then known in this country. After his return to America, he published an article in the New York Medical Record in 1887, giving a full description of this colony. Dr. Peterson continued to write upon this subject and upon every opportunity espoused the cause of establishing in New York State a colony for epileptics, being convinced that this was an immediate and pressing necessity.

* Read at Quarterly Conference at Craig Colony, September 15, 1928.

The State Charities Aid Association, among other organizations, became interested in the matter, and a sub-committee consisting of Dr. Peterson and Dr. George W. Jacoby made the following report of the subject: "That hospitalization is impracticable is the opinion of all who have investigated the subject. Those epileptics who are only slightly affected by their disease will not remain in a hospital without occupation and systematic employment, and those who are severe sufferers with marked mental affection cannot be kept there. Even the care of simple epileptics, without any insanity, differs greatly from that of any other class of patients, and their treatment in any hospital is a difficult matter. With the organization of wards in general asylums, matters are in the same unsatisfactory condition. The plea of certain supporters of the asylum system, that every epileptic should be legally placed in confinement, because he is either insane or may become so eventually, is a plea which is contrary to every principle of right and wrong. If a hospital for epileptics were consolidated under one management with an asylum, it would be necessary to make a distinction between temporarily mentally deranged epileptics and purely convulsive ones, a distinction which is decidedly artificial, as thus the temporarily mentally disordered epileptic would be constantly transferred from hospital to asylum and from asylum to hospital. On the other hand, the entire question can be solved by the creation of colonies, the admission to which is not to be regulated by the mental condition of the patient, but in which, after admission, a classification could be made of those afflicted with severe mental defects, of those who are able to work, and of those requiring education. Further classification, according to general aptitude, frequency of attacks, temperament, and educational status, would, of course, be advisable."

The State Commission in Lunacy, in its third annual report, submitted to the Legislature in 1892, recommended separate care for epileptics, as follows: "There can be no question as to the desirability of the State making special provision for epileptics of the dependent and semi-dependent class, apart from the insane. The practice which now obtains of confining epileptics proper in hospitals for the insane, as insane persons and commingled with the insane, is an injustice to both classes, and one which, in the opinion of the Commission, the State should take early steps to remove by

the establishment of a State hospital especially devoted to the custody, care, and treatment of epileptics."

On May 12, 1892, a bill was passed authorizing the selection of a site for a colony for epileptics. A large part of the summer of 1892 was taken up by members of the committee, subsequently appointed, in examining sites and collecting information bearing on the subject. The committee found that the center of the epileptic population of the State was in its southeastern portion, and would have preferred to locate the colony there had circumstances warranted, but the mountainous character of the country and other objections rendered it impracticable.

In the report of the State Board of Charities on the selection of a site for the colony, mention is made that "By the terms of the statute the provision for epileptics is to be on neither the old institutional plan, nor is modification by the substitution of detached buildings, as at Willard State Hospital. The colony idea is essential, as is shown by the express language of the law as well as its spirit, and by the needs and nature of the proper care and treatment of epileptics in community life. This colony design includes not only the separation of the patients into detached buildings, but the arrangement of the cottages upon irregular lines and at different distances, in accordance with the situations of the various building sites, adapted to the self-support of the inmates through natural advantages for economy of administration, and for the successful prosecution of trades, industries and agricultural labors."

Among the recommendations made by this committee, were the following: "There should be established in Livingston County in this State a colony for epileptics, to be known as the Sonyea* Colony."

"There should be excluded from the colony, at least in its beginings and formative stages, all insane epileptics, for two reasons, viz.: First. Their presence would throw a cloud over the brightness and joyousness that should prevail so far as possible, would set limits to the free life of the colony, and would tend to restrict commitments and instrustments of non-insane patients. Second.

* Indian word meaning "Sunny place." Some years ago the question was put to me as to the derivation of the word "Sonyea," and I asked the inquirer what he understood as the meaning of the word, and he said "State of New York Epileptic Asylum." I told him that I had seen the name "Sonyea" on an old deed written when the Shakers bought this property in 1837, and I did not believe the people in those days could look into the future far enough to give it that name.

Proper buildings and accommodations for insane epileptics would cost more than due provision for the insane at the existing State hospitals; inasmuch as there buildings and appointments for administration are already provided; and any saving to the State at the said hospitals by transfers of patients from them to the colony would be more than offset by increased expenditure at the colony."

"The objects should be to secure a community, for the humane, curative, scientific and economical treatment and care of epileptics, exclusive of insane epileptics; to fulfill which design there should be provided, among other things, a tract of fertile and productive land, in a healthful situation, with an abundant supply of wholesome water, sufficient means for drainage and disposal of sewage, and sanitary conditions; and there should be furnished, among other necessary structures, cottages for dormitory and domiciliary uses, buildings for an infirmary, a schoolhouse and a chapel, workshops for the proper teaching and productive prosecution of trades and industries; all of which structures should be substantial and attractive, but plain and moderate in cost, and arranged on the colony or village plan."

"The indirect results of proper provision for the medical treatment and education of epileptics, and their employment in the profitable prosecution of trades and industries and agricultural labors in colony life would be to remove from the almshouses duties which they cannot discharge; and to release poor and indigent families for their tendencies to become dependent upon charity, on account of their infirm members; and thus to promote a wise and true economy and public policy in the prevention of pauperism."

The purchase of the property finally chosen was authorized by the Legislature of 1894, the price paid being $115,000 for the former Shaker Colony, located in Livingston County. The new institution at the suggestion of Governor Roswell P. Flower, was named in honor of Oscar Craig of Rochester, then just recently deceased, who had been president of the State Board of Charities, and was chairman of the committee for the selection of the site.

The first Board of Managers, five in number, assumed office April 25, 1894, electing Dr. Frederick Peterson, still a member of the Board, as president.

Upon the colony property were several Shaker buildings, which

were repaired and altered, most of which are still in use and probably will be for a long time to come. It was the opinion of the State Board of Charities, concurred in by the managers, that the buildings were suitable for colony purposes. The statute establishing the colony required the managers to adopt a general design to which all buildings then or hereafter erected should conform. To comply with this, the property was surveyed and plans outlining the location of buildings, landscape embellishments, etc., made by Olmstead Brothers of Brookline, Mass. The buildings to be erected were designed by Carriere and Hastings, architects, who stated: "Although of harmonious design, each respective building was to vary from the others in detail and outline, so that its relation to them was not apparent. The external design of the several buildings was to be of a purely domestic nature, each appearing to represent a private residence in architectural character and proportion, and corridor and other structural connection avoided in order to fully dissipate institutional effects." The architects also stated: "By the adoption of a diningroom in each respective building, the home life is maintained, and patients from several buildings are never massed together and embarrassed with the idea that they are a common lot, and furthermore, a patient is thus not exposed to inclement weather, cold and storms (natural in this climate) in going through the open air to meals, when probably (unknown to his caretakers) he may not be in a physical condition to warrant his doing so."

The reason that I present some of these comments is to show the ideals that were held by the State Board of Charities, the committee who selected the site and the first Board of Managers. Of course, it has been impossible to carry out the plans to the degree hoped for, especially in the women's group.

Dr. William P. Spratling was appointed medical superintendent on November 17, 1894, and continued in that position until his resignation took effect in October, 1908. He was succeeded by the writer.

The first patient was admitted to the Colony January 27, 1896. Since the opening of the colony there have been admitted 4,289 males and 3,061 females, totaling 7,350. On September 1, 1928, there were resident at the colony 772 males and 804 females, total-

ing 1,576, and 93 on parole. The number of buildings now at the colony exceeds 100, patients' cottages varying in size accommodating from 15 to 225, the majority having a capacity not exceeding 50 patients. Because of the remote location of the colony, the nearest village being four miles distant, over 30 frame cottages have been built for married employees.

In the early days of the institution, in the haste to provide dormitory space for patients, many of the essential buildings for proper administration were not erected, e. g., reception and observation cottages, nurses' and attendants' homes, general assembly hall, etc. Some of these structures have been recently built under the bond issue funds, others being still unprovided.

Although more than thirty years have elapsed since the colony was first opened for patients, there have not as yet been made available sufficient resources for extensive scientific research as implied in the law establishing the colony. Bio-chemical studies in epilepsies should be broadly and thoroughly made. Providing a sufficient personnel can be secured, investigations in neuro-pathology could be profitably carried on; as also investigations into possible alterations in organs other than the brain, e. g., kidneys, endocrines, gastro-intestinal tract, and various glands connected or associated therewith, etc. Systematic study in careful detail might ultimately result in findings of great value in regard to the causation and therapy of convulsive disorders.

Institutions for Epileptics in Other States

In Ohio, as far back as 1879, a bill for the establishment of a state institution for epileptics passed one branch of the legislature. In 1890, a law was enacted providing for a hospital for epileptics, including epileptic insane. The Ohio Hospital for Epileptics at Gallipolis, was opened to patients November 30, 1893, being the first special institution in America designed solely to care for epileptics. The next year a laboratory was provided and in July, 1897, Dr. A. P. Ohlmacher was appointed full-time pathologist to pursue studies in gross and micro-pathology, chemical pathology and investigations along clinical and therapeutic lines. Subsequently Dr. Ohlmacher stressed the role played by persistent thymus and lymphatic constitution in producing certain forms of epilepsy. He felt

there was relationship between epilepsy and rickets, infantile convulsions, thymic sudden death, tetany and possibly exopthalmic goitre. In one paper Dr. Ohlmacher expressed the hope that pathologists might make investigations other than on the brain in their studies upon epilepsy.

At the present time, the Gallipolis Hospital has in residence well over 2,000 epileptic patients, receiving both sane and insane.

The Massachusetts Hospital for Epileptics was established in 1895, and opened for patients May 2, 1898, under the supervision of Dr. Owen Copp. This institution is now known as the Monson State Hospital, being originally designated as the Massachusetts Hospital for Epileptics and located at Palmer, near Springfield.

In the first report of this institution, it was mentioned, "It is evident to any person who has had the slightest experience with any number of epileptics, that there is the greatest difference in the mental condition of such persons. Some are said to be of unusual mental endowment and intellect. Many are of average capacity and mental development—essentially as healthy people except that they are subject to an occasional fit, while others are mentally enfeebled, this infeeblement being of all degrees, from the slightest possible trace, scarcely to be detected by the expert, to the lowest degree of dementia, where the patient is bedridden, unable to speak or to feed himself, and has to be cared for in every way as a child. In many of the demented cases the enfeebled mind, incapable of a full and clear understanding of its surroundings and incapable of self-control, is extremely excitable and irritable, so that these persons have to be watched continually, lest in an outburst of violence or temper they injure themselves or others."

"It is obvious that it is impossible that perfectly sane persons, healthy except for an occasional fit, should be placed in contact with the insane or partially insane already described. While we can now make a partial division or classification by dividing the patients into different wards, it is necessary that we should before long have a building separate from the others and possibly at some distance from them, for the reception of such sane epileptics as are essentially healthy except for an occasional attack, and are able in most respects to lead a natural, normal life."

Reference is made to the fact that all epileptics whose mentality

permits are much better both physically and mentally when obliged to do some regular work, i. e. systemized occupation is of primary consideration in the treatment of epilepsy. To arrange this requires infinite tact, patience and persistence which may be minimized in an institution but not eliminated by any system of care.

At an early period of its development the Monson State Hospital established a laboratory for carrying on investigations in the problem of epilepsy. Dr. M. B. Hodskins, the present superintendent, is much interested in research, not only in organic changes in epilepsy, but also bio-chemical.

Drs. Wm. N. Bullard, Everett Flood and E. E. Southard were for many years actively interested in the work of this particular hospital.

In 1895 the legislature of New Jersey enacted a law appointing a committee to investigate the advisability of establishing a special institution for epileptics. In an effort to ascertain as to the number of prospective patients, the result of a canvass of the situation gave a total of 1,060. The commission stated, however, that inasmuch as two-thirds of the physicians and many of the institutions failed to report, probably there were more than twice the number of epileptics in New Jersey. In other words, not more than one-half of the actual cases were ever included in any census, there being a natural indisposition for patients or their friends to acknowledge the existence of the disorder. In many others, the condition was not diagnosed. From observations made in then existing institutions for epileptics, the commission in its report made the following statement: "The collection of a small number of patients suffering from this peculiar malady, in so small a compass, might give rise to a doubt as to its benefits to the patients, but the forbearance and patience they are compelled to learn serve as a discipline. They seem pleased to assist one another during the time of seizure, and display an affection and tenderness to each other that is surprising."

In March, 1896, a bill was signed establishing a special village for epileptics which was later located at Skillman, practically in the center of the State*. It was mentioned in the first report of the managers of the new institution that since restraints of an epileptic

* The first superintendent was Dr. Henry M. Weeks, father of the present superintendent, Dr. David F. Weeks.

village cannot be so strict as those of a hospital for the insane, the village should be in a retired situation, not directly located upon a railroad line or upon a frequently traversed public highway. The board further stated, that it was "determined to keep constantly in view the purpose to make the village in the end nearly or quite self-sustaining." This was, of course, a high ideal which could not be attained. The board well stated that a large proportion of epileptics were as well able to work a part of the time under proper supervision as are persons not epileptic. Because of recurring seizures many epileptics, although entirely competent in various trades and professions, could retain no situation.

The long continued interest in the subject of epilepsy and the care and treatment of epileptics is manifested by the extensive literature. About 30 years ago a number of persons concerned with the care and treatment of epileptics organized the National Association for the Study of Epilepsy, and the care and treatment of those having the disorder. The prime purpose of this society was to arouse interest in the various states of the Union and in Canada so that suitable provision might be made. As the result of the activities of this organization a number of states established special institutions or made provision in existing institutions for epileptics. A year ago the society became a section of the American Psychiatric Association. The National Association was a member of the International League Against Epilepsy, active in several European countries before the World War, issuing a publication entitled "Epilepsia", which appeared over a period of years. Owing to difficulties ensuing from the World War, the activities of the international organization have not as yet been renewed, although several attempts have been made to revive it.

William Pryor Letchworth, at one time president of the New York State Board of Charities, was so interested in epileptics that in 1900 he published a volume referring to their care and treatment in the various parts of the world. At the time of the writing of the book, much more had been done in Germany, England, Switzerland, and Holland for the care of epileptics than had been attempted elsewhere. Mr. Letchworth felt that institutions for feebleminded were not suitable for epileptics of better mentality. Intelligent epileptics naturally felt sensitive at being classed with

mentally defective persons. He believed that different diet and different educational methods were required for the epileptic. The opinion was expressed that bringing together a considerable number of epileptics would be helpful inasmuch as it would awaken sympathy for each other, thus tending to lessen selfishness and develop an indirect disciplinary influence required by many. Mr. Letchworth was of the opinion that there should be cooperation with private benevolences to the effect that special private institutions might provide for some epileptics. He held many advanced ideas regarding the development of such institutions, particularly in regard to types of buildings, architecture, provision for temporarily disturbed patients, accommodations for officers and employees, education, employment, training of nurses, etc. He stated that the kitchen and laundry should be but one story in height and should never be located in the basement. He believed that for one or two-story buildings, wood construction might be considered. In regard to naming the institution, he finally stated that "the word 'epileptic' should be omitted, that its beneficiaries might not be continually and unnecessarily reminded of their peculiar infirmity."

Those concerned in the welfare of epileptics have long mentioned the peculiar misfortune of such patients who by the very nature of their disorder are debarred from the two things most essential for relief, regular occupation and congenial contacts with others in their community. Many pursuits are absolutely closed to the epileptic owing to special dangers to one subject to seizures, and many occupations, because of the natural unwillingness of employers to engage one who may at any time be temporarily disabled. This enforced idleness has a bad effect on the mental make-up of the patient and often on the relatives. It was long since shown that in the special institution many patients because of the liberties granted, although under a certain discipline, improved both physically and mentally.

Following the establishing of special institutions in Ohio, New York, Massachusetts and New Jersey, similar institutions were arranged for in Texas, Indiana, Kansas and Michigan. In Canada there is a small hospital for epileptics located at Woodstock, Ontario. In some of the states in which special institutions are provided and in the remaining states of the Union, epileptics are

placed in institutions also caring for the insane or mentally defective or both, this largely depending on the population of the respective states. In New York State insane epileptics are placed in hospitals for the insane. In Michigan, epileptic children of school age are placed in the institution for mentally defective at Lapeer, where special facilities are provided for education. Iowa, Virginia, Connecticut and Illinois originally established special institutions for epileptics, but later arranged so these institutions would also care for mentally defective persons not epileptic. In Illinois after considerable looking into the matter, an institution was finally established and opened at Dixon, but few patients came. The secretary of their Board of Control visited our Colony and asked me how we were able to encourage patients to come to the institution. I informed him that our experience had been quite the contrary, that we always had more than we could take care of, having a considerable waiting list. In Missouri, epileptics are cared for in an institution at Marshall, where provision is also made for the feebleminded. It has two small private institutions for epileptics, one similarly in Pennsylvania, under the management of the Lutheran Church. Pennsylvania also has a private institution at Oakbourne, south of Philadelphia, and last year established a state institution for epileptics at Selinsgrove in the central part of the state. Minnesota has just established a special colony for epileptics, these patients having been previously cared for with the feebleminded at Faribault.

The purpose in mind in establishing a special institution for epileptics was to allow for regularity of life, a reasonable discipline, simple diet, so far as might be possible the providing of a suitable occupation, recreation, and hygiene, with school facilities available for the younger patients of mentality sufficient to avail themselves of this opportunity. Unfortunately, many have been poorly advised, and as a result they form the impression that they are invalids and should not under any circumstances do any work.

At the last meeting of the section on convulsive disorders of the American Psychiatric Association, a research committee was appointed, with Dr. Adolf Meyer, of Baltimore, as chairman. It is hoped that interest will be aroused among all those having to do with epileptics, so that a number of lines of investigation may be

proceeded with in an effort to throw additional light on this disorder.

I reviewed at considerable length in an address given before your body in April, 1927, the colony plan of caring for epileptics, and referred in detail to many of its important features, some of these being the following: "Any alleged increase in the number of epileptics in any community is probably more apparent than real, statistics being so incomplete that they must be cautiously accepted, and remembering the interpretation of the term epilepsy and what it includes differs widely."

"The number of applications for admission received by the colony from the different political subdivisions of the State varies out of proportion to their population."

"Whether hospitals for the insane should care for all insane epileptics, or whether Craig Colony should be provided with proper facilities to relieve the State hospitals from caring for a number of such patients has been considered in the past."

"A 2,000 minimum capacity for the Craig Colony was originally planned for. The number of applications for admission has always exceeded the capacity."

"Cottages to permit of proper classification minimize undue friction and promote a quiet and more peaceful atmosphere, thus tending to relieve excitement and lessen seizures."

"In the institution carefully selected patients can accomplish much, but even with the best the handicap of abrupt attacks of impairment or loss of consciousness, often without warning, precludes the possibility of their being depended upon to the degree possible with selected cases among the insane, feebleminded, etc. Because of this disturbance of consciousness, epileptics cannot ordinarily be placed in branch colonies unless located immediately adjacent to the main institution."

"If facilities for classification were improved, more of the brighter and more recent cases might be expected to apply for admission."

"School work at the colony is important, not only giving to patients of suitable age the same opportunity afforded school children elsewhere, but having material bearing on treatment of their epilepsy. While some, being mentally subnormal, cannot take full

advantage of the educational opportunities, nevertheless, the school affords outlets which, normal in themselves, tend to benefit all its pupils. In the present plan of cooperation, the Geneseo Normal School students are given opportunity for personal observation and application of methods used in teaching problem children."

Although probably at the present time there are in New York State epileptics many times greater in number than the present population of the colony, if those epileptics who are insane continue to be cared for in the State hospitals, it is doubtful if it will be necessary to enlarge Craig Colony beyond a capacity of 2,000 or perhaps, 2,500 patients. Such capacity will probably permit the accommodation of all of those desiring institutional treatment.

THE RELATION OF EXOGENOUS FACTORS TO THE ONSET OF GENERAL PARALYSIS

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The incidence of exogenous factors as precipitating causes in the production of symptoms of general paralysis has been variously estimated by several investigators. Indeed, a more elementary question, namely, whether exogenous factors actually instigate the symptomatology of general paralysis, is still under discussion. One of the most difficult problems has to do with the reason or reasons for the appearance of the symptoms of general paralysis, independent of the consideration as to whether the cause be exogenous or endogenous. It is needless to say that syphilis is a prerequisite; but there must be syphilis in addition to some other factor or factors in the human system to account for the development of the mental disease. It is not known, for example, why some individuals may exhibit strongly positive blood and spinal fluid Wassermann reactions over a period of years without manifesting any further evidence of syphilitic involvement.

Southard and Solomon,[1] citing a case from the service of P. Marie, Chatelin and Patrikios, ask if "paretic neurosyphilis ('general paresis') can be lighted up by the stress of military service without injury or disease." They do not answer the question, though it is inferred from the case cited that it may be probable. The authors refer to a case reported by Donath[2]; their opinion was that the case was to be regarded as "a paretic neurosyphilis liberated by shell-shock (using shell-shock in the sense of a shock *without* direct brain injury)."

Osnato[3] mentions a patient in whom "the trauma was emotional." The man was "entirely efficient and dependable in his work until he was drafted into the army. His mental reaction was like a war neurosis in every respect." He was diagnosed as a psychoneurotic and was discharged from military service. He was later seen by Osnato, who made the diagnosis of general paralysis, not only because of the intellectual defects exhibited, but also because the blood and spinal fluid Wassermann reactions were posi-

tive. "The problem of the emotional factors in the production of this condition is forcibly introduced here." Osnato reported on cases of general paralysis precipitated by head trauma, influenza and prolonged etherization.

Mayer[4] and Hauptmann,[5] working independently, arrived at the conclusion that exogenous factors did not play any essential rôle as regards the *onset* of general paralysis. They investigated the question with the latency period in mind, and claimed that the interval between the time of infection and the first appearance of metaleutic symptoms was essentially the same under conditions of warfare as they were in times of peace. Weygandt,[6] in a study of 44 patients with general paralysis, was able to substantiate the opinions of Mayer and Hauptmann. Bonhoeffer[7] Meyer,[8] Pilcz[9] and Ritterhaus[10] likewise hold the same view. Against this opinion is that of Stieda,[11] who, as a result of observations made during the Russo-Japanese war, felt that the latency period was appreciably shortened by wartime activities.

We have approached the problem in a different manner and with a different group of cases. Firstly, we are not chiefly concerned with the duration of the latency period, but rather with the relationship of the exogenous agents to the *onset* of symptoms. We are relating the results of our investigations to the frequency of external factors that appeared as *exciting* moments. We are not concerned herein with the prevalence of such factors after the symptoms have made their appearance. One cannot speak with reasonable certitude of the possible influence of exogenous features in those patients in whom a continuity does not exist between those features and the symptomatology. In other words, if a period of freedom from symptoms (symptoms due either to the exogenous or to the endogenous factors) exists, the doubt as to the relationship grows in proportion to the length of the free interval.

Secondly, the present case material is made up only of women, the majority of whom were housewives. A few were breadwinners. Ordinarily, they were not engaged in occupations that enhanced the opportunities for encountering traumatic situations, such as is the case in general with men. One might suspect, therefore, that physical trauma would play a more important part among, for instance, steel workers than among bookkeepers. The composition of our series of cases must be taken into consideration.

For the purposes at hand we have divided the exogenous factors into two groups, namely, those that may be termed physical and, secondly, those of a psychical nature. In order to prove a relationship between them and the symptoms of general paralysis it is necessary to demonstrate not only that the physical or psychical trauma resulted directly in a radical departure from the patient's usual habits of reaction, but particularly that the symptoms are at least in part those commonly seen in general paralysis. At times the differentiation may be impossible, since a head injury may give rise to symptoms that may be common to both, (e. g. alterations in pupillary and tendon reflexes). Some time ago we had under our care a woman who had received a severe trauma to the head; she had been struck by an automobile, had a long deep scalp wound and had been rendered unconscious. She remained unconscious for several hours and when she became conscious she exhibited memory defects, marked emotional instability, Argyll-Robertson pupils and hyperactive quadriceps jerks. As a routine procedure the blood and spinal fluid were examined for the Wassermann reaction; both were positive. Subsequently she was given anti-luetic treatment (tryparsamide) and within a few months she was well enough to leave the hospital. She has since returned to the working capacity she had manifested before the injury took place. If the Wassermann tests had not been performed it might well have been believed that the illness was of traumatic origin only. Indeed, the part, if any, that the influences of syphilis might have played is still unanswered. This case is cited to show the extreme care that one must exercise in arriving at an opinion regarding the significance of trauma in a case with positive blood and spinal fluid Wassermann reactions.

For this study we reviewed the histories of 138 female patients with general paralysis. Only those patients were selected in whom reliable, detailed information was available. Very few of the patients were breadwinners; the vast majority were housewives. Hence, one might expect that the incidence of traumatic factors such as commonly occur to the working class would be low. Indeed, as shall be seen later, that impression was borne out.

In evaluating the significance of psychogenic factors we were guided by the same criteria that are generally observed in the so-

termed functional psychotic disorders (e. g., in the schizophrenias and affective psychoses). Although this approach is certainly not without prominent and reasonable objections, it can at least be said that under present knowledge there is some justification for its usage. When, for instance, an asymptomatic case of general paralysis becomes morbidly depressed upon the death of a loved one, and when during the depression the signs and symptoms of active general paralysis make their appearance in undoubted form, it may reasonably be assumed that the death of the loved one acted in a provocative manner. This is particularly more significant when the psychic disturbance is accompanied also by marked loss of weight, leading to reduction in the realm of resistive forces. Some time ago we had the opportunity of observing the probable relationship between the loss of weight as a primary condition and the onset of general paralysis as a result. A male patient desirous of increasing his insurance underwent intensive activity for the purpose of attaining the average weight limit. In the process of reduction the symptomatology of general paralysis appeared and it was considered that the increased activity and consequent loss of weight was at least in part responsible for the appearance of the psychosis. Cases such as this lead us to feel that factors resulting in lowered body resistance may in some manner set the latent paralytic process in motion. Whether the agent be psychogenic (as in the first case) or somatogenic (as in the second case) is of no special importance. It is, of course, appreciated that the various forces at work are not accurately measurable.

Since general paralysis in the acquired form ordinarily has its onset well after puberty and before the climacterium, the psychophysical changes attendant upon those periods generally do not complicate the issues. The more important of the two is the climacterium which more specifically plays a part in female patients. Not infrequently we have seen clinical pictures in women paralytics that have persisted long after the process of general paralysis has been arrested; we are definitely of the impression that the changes due to the menopause may often obscure the results achieved by specific or non-specific therapy. This seems likely particularly in those patients who, following therapy, show almost exclusively trend or affective reactions, and who are relatively free from

organic symptoms. We have in mind a woman who began to exhibit psychotic and climacteric symptoms simultaneously at the age of 46. After extensive treatment by tryparsamide and malaria there was a complete remission of physical signs and symptoms (save for the retention of pupillary and quadriceps changes), but there remained disturbances in the affective and ideational spheres that are not infrequently seen in the involutional period. It is quite probable that from the standpoint of general paralysis itself there are no residual symptoms, and that the psychotic elements are to be explained on another basis. Hypothetically it is just as probable that the process of general paralysis can and does provoke a psychosis of an involutional character as it is that the reverse takes place. We are, of course, too little acquainted with the origin and meaning of the various factors accompanying general paralysis to speak with certitude; nevertheless, we are not justified in ascribing categorically to general paralysis all the symptoms that are simultaneous with it. It would be unfair, for instance, to include the symptoms of an adenomatous thyroid (unrelated to, but contemporaneous with the symptoms of general paralysis) with those of general paralysis. Analogous situations are encountered in patients who constitutionally were abnormal before the symptoms of general paralysis made their appearance. Those, for example, who are definitely schizoid or schizophrenic and who later develop general paralysis are prone to retain the schizophrenic syndrome in accentuated form for an indefinite period after the paralytic process has been arrested. What attitude are we to take when called upon to gauge the results of specific or non-specific therapeutic measures? Obviously this difficult problem is not answerable at the present time; yet there are indications that point to the view that all that follows in the wake of general paralysis may not be the result of that diseased condition *per se.*[*]

The rather lengthy digression was inserted to emphasize the care that must be exercised in the evaluation of the syndromes operating in general paralysis.

In the 138 patients studied for this report, five (equal to about 3.5 per cent) had experienced exogenous agents that could reasonably be regarded as instrument in the *provocation of symptoms* of

[*] See: Personality and General Paralysis. L. E. Hinsie, (to be published.)

general paralysis. Evidently we are not concerned with agents that appeared long before, or at any time after, the onset of general paralysis. Two patients were subjected to physical trauma, while three reacted morbidly to psychogenic situations. In each instance undoubted signs and symptoms of general paralysis followed without the intervention of any normal interval.

CASE I. A woman, 39 years old, was apparently in good health, until one day, while rising from a stooped position, her head struck a cabinet door. The blow was moderately severe; caused no superficial injury, but was sufficient to render her unconscious for several minutes. Immediately following the trauma she developed intense rightsided headache, which persisted for months. A few days after the trauma she began to lose her usual efficiency, exhibited mood changes, lost weight and later became delusional. She rapidly acquired signs that were grouped under the heading of general paralysis. The laboratory reports substantiated the diagnosis.

CASE II. A woman, 36 years old, was free from any mental or physical symptoms until she was struck on the head with a black-jack; she was rendered unconscious. The initial symptoms were related to the trauma and its effects, but at the same time that she was recovering from the injury the symptoms of general paralysis appeared.

In both of the above instances it is safe to say at least that the injuries precipitated the symptomatology of general paralysis. Both individuals would have gone on for an indefinite period if the trauma had not supervened. It would be interesting—we have no cases at hand to warrant an opinion—to observe patients with the so-called asymptomatic type of general paralysis in the event of head injury without the sequelae (general paralysis).

Three of the 138 patients developed the clinical picture of general paralysis in definite association with morbid psychogenic states. One must practice much care in the attempt to establish any cause and effect relationship between the two. Was the patient subjected to such morbid states before the acquisition of syphilis and later after syphilis had been acquired? If so, is there any reason to believe that the mental state itself could be held responsible for the onset of the symptoms of general paralysis. The first question assumes importance because it is helpful to rule out, if possible, the occurrence of a mental reaction as a result of an insidious organic process that does not yet manifest itself in any evident organic

signs. It is claimed, even if not well proved, that reactions of a psychogenic nature may antedate the more florid symptoms of general paralysis by a long period. Indeed, the diagnosis, neurasthenia, is far too frequently made in incipient cases of general paralysis, when in reality the reaction might be more accurately described as a neurasthenic syndrome. The second question, touching upon cause and effect, is significant. It is believed that mental states in themselves probably cannot directly instigate the process of general paralysis, but they can perhaps do so in an indirect manner, namely, by lowering the general body resistance to the point of allowing the spirochetes to get into action. This seemed to be the course of events in the three cases cited further on. We had to make sure that we were not dealing with the situation in which morbid mental states were the result of reduction in the patient's capacity due to the organic injury. Even with the most careful investigation it was not at all certain that we were on safe grounds.

CASE III. A woman, 38 years old, who had been dependent upon her paramour for a period of 12 years, developed a state of profound depression upon his death. Accompanying the depression was anorexia, insomnia and loss of considerable weight. There had been no evidence of physical or mental abnormality prior to the death of her lover. Within two months' time her general physical condition was strikingly reduced and while in this state neurological signs and symptoms appeared; the latter, together with positive Wassermann findings in the blood and spinal fluid lead to the diagnosis of general paralysis.

CASE IV. A woman, 49 years old, became acutely depressed upon the death of her husband. She had not had any physical or mental disturbances prior to that event. The depression lasted for seven months, during which she became debilitated to a marked extent. At the end of the seven months' period neurological signs and symptoms became evident and with verification by the laboratory tests the diagnosis of general paralysis was made.

CASE V. A woman, 30 years old, whose life was intimately bound with that of her father, entered into a phase of deep depression when he died. The depression continued for several months, during which time her physical condition was considerably impaired. There had been no evidence of any diseased condition prior to her father's death. About three months after the depression began, and while it was still continuing, mental and physical symptoms of general paralysis set in.

These three patients had several features in common, namely, *pronounced debility* accompanying a *depressive* episode in individuals who had previously been in apparently good health. In each instance the symptomatology of general paralysis made its first appearance long enough after the initial symptoms of the depression and its associated physical debility to warrant the opinion that the paralysis was brought into evidence by the effects produced by the depression. A point of differential importance presents itself in the fact that there was not any interval of alleged normality between the two conditions. Moreover, the principle in the three cases differs widely from that in which depressions follow, even closely, the physical and mental defects due directly to the general paralytic process. In the latter instance the depression is to be regarded as an effect not as a cause of the organic disease.

To be sure, we encountered a wide variety of mental reaction types in the group of 138 patients. But, a careful study of all the factors involved failed to establish *causative* relationship to the *onset* of general paralysis in more than the three cases cited in the foregoing.

In summary, then, we repeat that in a study of 138 carefully selected female patients with general paralysis the *onset* of the disease was conditioned in two patients by physical trauma and in three patients by psychical states.

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SYMPOSIUM OF REMARKS MADE AT HEARING GIVEN BY NEW YORK STATE CRIME COMMISSION TO PSYCHIATRISTS AND CRIMINOLOGISTS

FOREWORD BY DR. V. C. BRANHAM, MEDICAL DIRECTOR OF THE NEW YORK STATE COMMITTEE ON MENTAL HYGIENE

The open hearing given psychiatrists and criminologists by the New York State Crime Commission on November 21, 1927, was the result of two previous conferences of the joint committees of the New York State Committee and the Prison Association of New York. These meetings were for the purpose of determining a better means for bringing about a more complete understanding on the part of the laity as to the purpose for which psychiatry stood in the field of criminology. It was felt that the whole question of expert testimony, methods of examination of prisoners, and psychiatric study and care of prisoners after conviction were matters which deserved prolonged study and open discussion.

Accordingly, it seemed advisable to bring the matter to the committee of the State Crime Commission which had already interested itself considerably along these lines.

The hearing was attended by a representative group of psychiatrists and criminologists, who are authorities in their respective fields.

In arranging this symposium, it is felt that the collective views of these authorities will be of decided interest to those who have been following the rapidly developing relationship between psychiatry and criminology.

Dr. Kieb, Commissioner of Correction, acted as the official spokesman of the group during the course of the hearing.

PSYCHIATRIC EXAMINATIONS AS A ROUTINE COURT PROCEDURE

BY C. FLOYD HAVILAND, M. D., SUPERINTENDENT, MANHATTAN STATE HOSPITAL

Psychiatrists seek exactly the same objectives as are sought by other groups interested in the crime problem, and especially by the State Crime Commission. It seeks increased security to the community from criminal depredations, the prevention of crime, and

when possible the rehabilitation of the criminal. Contrary to a more or less prevalent impression psychiatry in dealing with the criminal problem has no room for soft and false sentimentality. It seeks only to investigate and determine when possible the fundamental causes of criminal conduct in terms of the antecedent mental activity of the individual concerned and the mental factors underlying such mental activity.

The primary difference between the psychiatric approach to the criminal problem and other modes of approach is the greater emphasis psychiatry places upon the criminal. It deems the criminal the primary object of study, regarding the crime itself as relatively unimportant and frequently determined by more or less accidental circumstances.

In seeking the control of any social problem resulting from asocial and antisocial human conduct, it is obvious that knowledge of causative factors must be gained before actual control results. It is, therefore, but common sense to study motives and mental operations outwardly expressed in crime. Psychiatry believes that every criminal should be studied from the psychiatric viewpoint, and not only offenders suffering from mental disease or defect, although, of course, the latter should receive especially close study.

Under present practice the disposition of the criminal is determined largely by the crime he commits without any regard whatever to the mental condition resulting in crime. In other words, the more or less accidental result of the functioning of antisocial mentality is used as a basis for the criminal's disposition rather than the antisocial mentality itself, a course of procedure which is actually illogical.

If the psychiatric aspects of crime were paramount, and the mental condition of the criminal used as the basis for continued detention, with parole or discharge granted only after psychiatric examination gave a reasonable expectation that further criminal conduct need not be anticipated, it is certain that in general criminals would be much longer confined than is now the case, with increased security to society.

While it is recognized that the insane and defective offender requires special treatment in special institutions, it is less generally appreciated that there is a third group of delinquents who are

abnormal, but who are neither defective nor suffer from mental disease. Such group is made up of the so-called psychopathic delinquents. Psychopathic persons are those who have failed to acquire normal emotional stability. They have failed to "grow up" emotionally, and so far as the emotional side of their make-ups is concerned they remain on a childhood level. They are people who are constantly at odds with society and with those about them. They are unable to "fit" even when environmental conditions are most favorable. They are the people who never escape "hard luck," who are the supposed victims of ill treatment throughout their lives, projecting as they do their own emotional inadequacies upon others whom they hold responsible for their inability to socially adjust.

While it is true there is still much to learn about psychopathic individuals, they are usually easy to recognize, and while, of course, they do not all become delinquents, when they do develop criminal tendencies they constitute a special problem and should be cared for in special institutions. Psychopathic delinquents, least of all criminals, should not be paroled or discharged except on the basis of psychiatric examination. That would mean that as a group they would require much longer institutional residence than the average criminal, and hence the desirability of special institutions apart from the need of special treatment. If such individuals knew that their return to society depended only upon their own efforts to exercise emotional control and to adapt themselves to social requirements, it is certain that the conduct of an appreciable number of them could be modified so that they would no longer constitute the serious social menace which now exists through their presence in society.

The excellent results which have been obtained in dealing with defective delinquents at the Institution for Defective Delinquents at Napanoch, N. Y., points to the results which might be obtained if psychopathic delinquents were dealt with in the same way.

In considering the enactment of a law in New York similar to the Massachusetts law to which reference has been made, heed must be given to the volume of work which would follow the enactment of such a statute. Perhaps from that point of view it might not be regarded at present as practicable to provide for the routine exam-

ination of certain offenders in the same way as Massachusetts has done, but it is my opinion that it would be theoretically advisable to do so. While it may be true that present facilities in New York are reasonably adequate to sift out criminals suffering from mental disease and those who are defective following conviction, yet it would seem not only a humane but an ecomonical procedure to provide for sifting out all abnormal offenders prior to trial rather than after conviction, thus rendering unnecessary numerous expensive trials, and particularly would it eliminate, as it has in Massachussetts, the deplorable spectacle of the so-called "battles of the experts."

Any routine psychiatric examination of criminals prior to trial should be made by competent psychiatrists regularly employed by the State, and hence it would seem proper to have the work done by a bureau created for the purpose in the State Department of Mental Hygiene.

The recently established classification clinic at Sing Sing Prison provides excellent facilities for the medical and psychiatric examination of all convicted felons sentenced to that prison, but similar provisions are needed to render such examinations available as a routine measure covering all convicted felons in the state.

I would like to endorse earnestly Dr. Kieb's suggestion of a special building at the New York State Reformatory for the continued observation of all convicted felons throughout the State who manifest evidence of a psychopathic personality. Should such building be provided it would render it possible to segregate psychopathic criminals with tremendous advantage to the prisons where the psychopathic individual causes most of the trouble which develops, just as it is the psychopathic person who causes a large share of all our social difficulties. Furthermore, if such a building were erected it would provide an opportunity for the close study of the psychopathic delinquent about whom knowledge is as yet admittedly limited.

So far as the prevention of crime is concerned informed opinion today recognizes the necessity of preventive efforts in early life. In large measure the social reactions of the adult reflect only tendencies and types of reaction developed in childhood. The present day interest in the study and solution of the so-called behavior prob-

lems of childhood augurs well for the future as efforts to such end will inevitably limit the development of criminal tendencies in later life. Already the lessened incidence of juvenile delinquency in some localities must be directly attributed to the work of juvenile courts in which scientific attention and treatment are given for the correction of behavior problems presented by juvenile offenders.

In brief, psychiatry seeks the introduction of the psychiatric viewpoint along the whole line of criminal procedure. It welcomes any opportunity whereby practical application may be made of psychiatric theory in the study of crime and in the disposition of the offender regardless of the character of the offense. It, however, recognizes that the introduction of psychiatry in criminal procedure must of necessity be slow and in the nature of an evolution, as the best results can only be expected as there is a sustaining public opinion which can only be developed as a knowledge of the facts involved become better known and better understood by the general public.

THE VALUE OF PSYCHIATRIC EXAMINATION OF COURT CASES NOT ACTUALLY INSANE

BY SANGER BROWN, 2ND, M. D., ASSISTANT COMMISSIONER, DEPARTMENT OF MENTAL HYGIENE*

The relation between psychiatry and criminology will become closer in the future than it has been in the past. We are, of course, well aware that the man who is frankly insane, or who is obviously feebleminded, is not a criminal in the usual, ordinary sense, and, for that reason, the usual punishment is not meted out to this type of offender as a rule, although occasionally the insane man is kept in an ordinary prison awaiting trial, and more often a feebleminded boy is not recognized as such when he commits a crime, and he may be held as fully responsible.

It is not of these cases that I wish to speak. We will, in time, make proper provision for this type of individual who gets into conflict with the law. In fact, in New York State, this need is already quite adequately met in respect to the insane, and a good beginning has been made in the institutions at Napanoch and Bedford for defective delinquents. I wish to speak, at this time, of another bearing of psychiatry upon criminal conduct. The psychiatrist is not

* Submitted by Dr. Brown after hearing.

only interested in the feebleminded or the insane. He is interested in any form of human conduct which is markedly at variance with the normal. Now, the criminal is not normal in conduct, as judged by the ordinary standards of society. This does not necessarily mean that he is feebleminded or insane. It does mean that he has mental traits and characteristics of such a nature as to result in delinquent conduct. The psychiatrist believes that, for the proper disposition of such a case, the underlying cause of such conduct should be known. That is, either the conduct is the result of inherent instability or the result of environmental influences; either the man is confirmed in a criminal career or the condition is of a temporary nature, the result of some mental difficulty of one type or another. After a thorough study, the psychiatrist would recommend that the case be disposed of in accordance with what such an examination brings out.

The psychiatrist makes an investigation of the man's mind from the standpoint of his early development and environment, his degree of intelligence and judgment, his self-control, his emotions, his past experiences and general background, family influences and other experiences in life. He then feels that intelligent recommendations may be made. Sometimes a minor offender is so unstable and irresponsible that he should be segregated in some way for a long period, possibly for the rest of his life. Sometimes a man who has committed the same offense may be of much more stable, responsible type, and probation may be recommended to the judge. Various recommendations may be made, according to the type of man with whom one has to deal.

In respect to probation, I have had an opportunity of studying a representative group of cases in New York City who were placed on probation by the judge or on suspended sentences. I have not found a large number of these men suffering from any form of mental disease, and not a great many of them are feebleminded; but most of them were what has been termed "socially defective." These either came from bad homes or had been under bad influences or were so unstable in self-control and judgment as to find themselves in difficulty. The judge did not regard these cases he

placed on probation to be, inherently, of criminal or delinquent character, but their delinquent conduct was one evidence of their inability to cope with life without guidance or assistance.

Now, these cases are in need of social supervision in the community and guidance in their work and in their home life. This cannot be given unless social agencies know the type of man or woman they are dealing with. So these cases have been carefully examined and directions given to the welfare worker as to how to rehabilitate such individuals as far as possible. Here then, is one place where psychiatry may be of value; to make recommendations as to how to give proper direction and supervision of cases on probation.

But I found in a number of cases that the judges wished to go further than this. At times they have sought advice as to how to dispose of a case awaiting sentence. In other words, the judge wished advice, before sentence, in order that the case might be properly disposed of. The judge did not believe the man to be either insane or feebleminded, and he knew that the man was guilty, but he wished to know what kind of a man he had to deal with. In these cases, the judge has stated that the report rendered by the psychiatrist was of much value to him in sizing up the situation. Here, then, is a further place where psychiatry will be of value. The judge does not have the time or special training to acquire knowlege as to a man's make-up, early development and other facts which go into a man's mentality. He wishes these facts before him. Undoubtedly, this work of psychiatry will be more extended in the future and the time will come when, eventually, individuals who are abnormal in their conduct will be carefully studied, their reactions will be appraised and they will be disposed of in accordance with such appraisal. Therefore, the segregation of the insane and the feebleminded who commit criminal acts is a relatively small part of the main problem, from the psychiatric point of view.

This work should be carried out under State auspices, by trained psychiatrists. The subject is so controversial that it should not be left to specialists privately employed for either the prosecution or defense. Such application of the knowledge which we already possess to the problem of crime will doubtless be one of the factors tending towards improving present conditions.

EXAMINATION OF PRISONERS BEFORE TRIAL

REPORT OF DISCUSSION BY JOSEPH W. MOORE, M. D., ACTING SUPERINTENDENT, MATTEAWAN STATE HOSPITAL

Dr. Moore outlined the methods by which examination of prisoners before trial is carried out in New York State and emphasized that these procedures, while not ideal, worked with satisfaction and he did not believe that any injustice was done to the prisoners nor that insane cases, excepting in a very few instances, escaped detection even though such detection rested upon observation by others than trained alienists. The prisoner in New York State may be referred for mental examination at any time from the day of his arrest until the day of his sentence, it being necessary merely that the possibility of insanity be called to the attention of the court by anyone interested in or coming in contact with the prisoner. At the time of trial another law provides that the patient may make a plea of insanity as a defense and the judge may then appoint a commission to carry out an examination. These examinations are usually thorough. The testimony is usually obtained from experts and a period of observation in Bellevue Hospital is often included in cases in New York City. Section 836 of the Code of Criminal Procedure also provides that instead of appointing doctors to examine the possible mental case, the judge may commit him to any of the State hospitals for observation and recommendation. After conviction, if the prisoner develops mental symptoms, he is promptly transferred to a hospital for mental diseases and as he is under observation of a psychiatrist in Sing Sing, the recognition of his condition is practically certain. Those prisoners who are under sentence of death are also under observation of the Governor's commission of three psychiatrists from the time of their admission to the condemned cells until they are executed or otherwise disposed of. All these provisions for psychiatric observation of prisoners in New York State apparently take care of the situation well enough at the present time so that a law similar to that in effect in Massachusetts is not necessary at this time. Provisions for simplifying and consolidating and making less expensive the observation of prisoners by commissions, are steps which are most needed and Dr. Kieb has for some years been laying the preliminary frame

work for an advanced method of furnishing psychiatric observation for prisoners. He has gone so far in this as to obtain facilities in the way of building and equipment to carry out his plans.

With regard to convicted misdemeants, who form something less than half of the admissions to Matteawan State Hospital, there seems to be more need of psychiatric observation and revision of procedure than in untried cases. Matteawan receives great numbers of feeble, dilapidated and deteriorated patients who have been insane for a period long antedating their arrest and have often been patients in other State hospitals from which they have escaped or been released. These cases go rapidly through the inferior courts in New York City and are sent to the penitentiary or workhouse where their conduct at once becomes apparent and they are sent to Matteawan. There is much need of psychiatric sifting of these cases, not merely at the penitentiary, but during the police period so that cases of this type can be weeded out and sent to civil State hospitals, instead of being convicted of misdemeanor which not only is unjust and unfair to the prisoner, but uneconomic and results in a serious overcrowding of Matteawan with cases which are notably unsuited for that institution.

SEGREGATION OF PSYCHOPATHIC AND MENTALLY DEFECTIVE RECIDIVISTS

BY FRANK L. CHRISTIAN, M. D., SUPERINTENDENT, NEW YORK STATE REFORMATORY AT ELMIRA

Psychological and psychiatric examinations have been conducted at Elmira for the past fifteen years and the results of these tests have been of great value in assisting to adjust the inmates of the reformatory to the institutional routine. More than one-half of the population of the Napanoch institution consists of inmates transferred from Elmira, and many more of our prisoners could be sent there did the capacity of the Napanoch institution permit of such transfer.

The psychopath, if a recidivist, should have permanent segregation. It is conceded that this class of prisoners is the most troublesome, whether actually confined in an institution, or after being paroled therefrom. When they have been paroled there appears

at present no satisfactory method of keeping them under proper supervision.

The management of Elmira reformatory causes the formulation of a "psychogram" of each inmate received at the institution, and furnishes each head of an institutional department, a summary of same, for his guidance in the assignment and adjustment of all inmates coming under the jurisdiction of his department. When an inmate is paroled, and before he is actually released upon such parole, a summary of this "psychogram" is sent to the parole officer to whom he makes his monthly reports.

It is considered that from 15 to 25 per cent of the population of the Elmira institution are definitely psychopathic; and in addition to these, there are other types of mental cases, so that one might classify nearly 60 per cent of our inmate population as being mentally abnormal.

As has been before stated, segregation is to be recommended for the recidivist, as he is in all instances a mental case. Such care is as necessary for him as it is for the feebleminded or the insane criminal.

THE ELIMINATION FROM THE COMMUNITY OF THE PSYCHOPATAIC RECIDIVIST

BY GEORGE W. KIRCHWEY, HEAD OF DEPARTMENT OF CRIMINOLOGY, NEW YORK SCHOOL OF SOCIAL WORK, N. Y. C.

I am no psychiatrist and, at best, only an amateur psychologist but it is just possible that this lack of technical equipment may make my contribution to this discussion of more interest to you. It is the story of a man groping through experience to a new understanding of an ancient problem.

I had scarcely become accustomed to my surroundings as the warden of Sing Sing Prison in the winter of 1915-1916 when I was called upon to deal with a case of murderous assault made by one prisoner on another. It was easy to know what to do with the victim of the assault. He was taken to the prison hospital, examined and put under treatment. It was not so easy to know what to do with the man who had committed the assault. The obvious thing to have done, and the thing that would usually be done in such a case, was to have referred the case to the district attorney of the

county, with the certain result that the man would receive another sentence to Sing Sing in addition to the one he was then serving. That would, as the saying goes, have served the ends of justice, but it still left the man on my hands, with the same power and, presumably, the same disposition that he had so dangerously displayed. So I took another course and invited the help of a distinguished psychiatrist, the head of a State hospital for the insane, to visit the prison and make an examination of the culprit. He was good enough to do so, made a careful examination of the man and reported that he was insane. A further official examination confirmed this diagnosis and the man was thereupon transferred to the State hospital for the criminal insane. A few months later a similar occurrence took place. I followed the same procedure as before and again had the satisfaction of getting rid of a dangerous member of the prison community and getting him placed in an institution where his insane tendencies could be controlled and adequately treated.

Now, this seemed to me a very wasteful way of ascertaining what members of the Sing Sing community were unsafe to live with, and so I set myself to the task of devising a method of procedure whereby the madmen might be weeded out before they had exhibited their madness in killing or attempting to kill their fellow prisoners. Out of this, with the wise and devoted cooperation of the late Dr. Thomas W. Salmon and other eminent psychiatrists, grew the first psychiatric clinic at Sing Sing.

In the meantime my education had been going on apace. The prison population was upon the whole an orderly one, but there were occasional breaches of discipline—fights, assaults and attempts to escape—and I soon discovered that though the acts were many the actors were few. The same men came up again and again for discipline. Again I consulted my psychiatric friends, only to discover that the majority of these offenders were not to be classified as insane but as constitutional bad-actors, apparently as incapable of profiting by experience or of controlling their emotional outbreaks as were the violent insane. It was in this way that I discovered the psychopathic or demoralized personality as the real problem in prison discipline, far worse, much harder to deal with or to control than the occasional violent lunatic. I didn't know how many of these there were but there were certainly enough of them to cause me constant uneasiness.

Then came the report of our psychiatric clinic, showing that something like 12 per cent of the population of the prison, some 200 in all, were definitely insane and another 18 per cent, that is to say 300 more, were irresponsible psychopaths—a total of 500 men out o a population of 1,500, who were to a greater or less degree, a menace to the peace and order of the prison community and many of them a positive danger to life and safety. But we didn't know who they were. The statistics in question were based on random samples, current admissions to the prison. For the most part the individuals which made up these dangerous classes remained unidentified and continued to mingle as before with the general prison population. To identify them would have been a useless formality. I had no way of segregating or treating them. The State had made no adequate provision, for the psychopaths no provision at all, for taking care of them elsewhere.

Then I sat in every month at the meetings of the Board of Parole. Man after man came up and pleaded his case for release. If he had behaved himself in prison he could generally count on being paroled at the expiration of his minimum sentence. If his prison record had been bad he might be detained a month or two longer. But the parole board knew nothing and could know nothing of the mental condition of the men apparently entitled to parole. So they were turned out—the sane and the insane, the normal and the psychopathic—to make their way as best they could in the world outside and then, after a few months or years, to come back again, perhaps more than ever a menace to the prison community and the plague of the prison administration.

I trust, Mr. Chairman and Gentlemen, that I shall not seem to exaggerate if I say that this is the most important issue that confronts you in your warfare against crime, and that the most vital blow that you can inflict on the enemy will be the elimination of this dangerous and demoralizing element from the prisons and from society. These are the true "repeaters", the real and, perhaps, the only "incorrigibles", and if they are, indeed, "irresponsible", as many of them doubtless are, that is the best of all reasons for protecting the community against them. This can be effectually accomplished only by providing for a thorough study by competent psychiatrists of every person convicted of crime and by the provi-

sion of a State psychopathic hospital as well as enlarged facilities for the criminal insane.

In conclusion may I venture to urge your consideration of what has here been referred to as the Massachusetts plan or some practicable modification of that device for identifying and eliminating these dangerous personalities, whether insane, psychopathic or feebleminded, before trial. The sooner we can get rid of them and put them where they belong, the better, both from the point of view of safety and of public expense. The courts now have the power to do this, but the power is almost never exercised. Let us make it a matter of routine procedure and have it done.

THE IMPORTANCE OF KNOWING THE PERSONALITY MAKE-UP OF THE CRIMINAL

BY CHARLES M. BURDICK, M. D., SUPERINTENDENT,
DANNEMORA STATE HOSPITAL

We are all interested in learning as much as possible about crime and the criminal, especially the causes of crime, its prevention and the reformation of the criminal, if that be possible. In order to gain this knowledge, it seems to me we must of necessity approach the problem with a scientific mind and spirit. In order that less emphasis may be placed on punishment and more on reformation, I believe we should pay more attention to the criminal as such and not so much to the crime.

Some time ago the medical profession was criticised for paying too much attention to the disease and its nature and not enough attention to the patient and his nature. In recent years, I am glad to say, we have seen more emphasis placed on the patient, especially with reference to his make-up, his personality and his character, that which we speak of as the sum total of his internal and external characteristics. This has been brought about largely through the efforts of the National Committee for Mental Hygiene, the American Psychiatric Association and other allied agencies.

As the result of the establishing of mental clinics, child guidance clinics and behavioristic clinics much has been learned as to the proper handling of many conduct disorders.

One of the greatest advances in modern medicine has been the application of psychological and psychiatric principles in the treatment of all kinds of diseases and human disorders. Each man is a unit with his individual tendencies, habits and desires. In addition to these we must consider his environment, his heredity and his innate characteristics, all of which make what we regard as human nature. In order to understand the problem of crime and the criminal, we must first of all recognize the existence of this individuality.

Crime as we understand it is a conduct disorder measured in terms of social customs and usages. We also recognize that every act and form of conduct, normal or abnormal, is motivated or occasioned by some form of thought process. Therefore, if we are properly to understand and evaluate conduct and behavior dependent on such thought processes, it must be done by those trained in the study of normal and abnormal thought processes, namely the psychiatrist and the psychologist.

I do not mean by this that we are merely to find out whether or not man is diseased physically or suffers from mental disease as such, but as the result of analytic, intensive study to learn something as to the criminal's make-up, his personality and his character, in other words, his individual self.

The advantage of this kind of study is that it forms a rational basis for treatment and reformation, if that be possible. Therefore, I feel that in the study of crime and the criminal, the agencies which have to do with him should have the guidance of psychiatrists and psychologists. First of all, in my opinion, courts of law should have the benefit of this guidance and counsel; secondly, when the criminal is convicted and goes to prison both he and society should have the benefit of an intensive study of his make-up by trained specialists. This will provide an opportunity for proper classification and treatment whether it be in the matter of prison discipline, instruction in the prison school, instruction in the industrial shop or in any other of the prisons' administrative activities. Another great advantage of such a study and of such a psychiatric approach is the valuable fund of information gained, which can be utilized

when the question of parole comes up, both by those entrusted with the responsibility of the parole and by the supervisory officers while the individual is on parole.

In order to carry out this idea, the principle of an indefinite sentence should apply. No individual is sent to a city hospital or to a hospital for the insane for so many months or so many years. He is sent there to remain until his condition warrants his discharge. I am convinced that we will never get anywhere with the mass treatment of the criminal. He needs intensive, individualistic study and treatment. Therefore, I am a firm believer in the psychiatric approach to the study of crime. Dr. Kieb, our present Commissioner of Correction, is intensively interested in this psychiatric approach and each month the staff of the Dannemora State Hospital is called upon to examine a number of parole applicants both at Clinton Prison in Dannemora and at Great Meadow Prison in Comstock. As a result of these examinations we have frequently found parole applicants who were definitely psychotic. Others we have found to be so mentally defective that their parole was not advisable, and in others we have found their condition such that the advisability of parole was questionable, and further observation has been recommended. This one feature, it seems to me, further emphasizes the great value of the psychiatric approach to the study of crime.

PSYCHIATRY IN THE TREATMENT OF THE OFFENDER

BY E. R. CASS, GENERAL SECRETARY OF THE PRISON ASSOCIATION OF NEW YORK*

Over a century has passed since Franz Joseph Gall emphasized the fact that it was the individual and not the crime that must be regarded as the basis of treatment. Yet today it is still "modern" doctrine, unappreciated in large measure. Men are sent to different prisons according as they are felons or misdemeanants, a legal distinction. Murderers are considered as far more vicious and depraved than thieves, and thieves than vagrants. The law assumes to be able to differentiate between degrees of crime, and sets maximum sentence according to the apparent seriousness of the offense —not according to the apparent mental and physical characteristics

* Submitted after the hearing.

of the offender. For the law has seized upon those characteristics which could be observed superficially and were apparent facts. Children were held to be less responsible than those over 16 years of age, and persons over 16 and under 30 years of age have been regarded as more reformable than those over 30. Insanity has been a cause for acquittal, or for removal to an insane hospital, but other mental conditions, not so clear cut or apparent, have passed by the law into prison. These conditions are recognized and pointed out by those who have long noted the unsoundness and the folly of the "mass" treatment of offenders.

Therefore, the requirement is that each individual delinquent must be known to those who are responsible for his care and treatment, not superficially but thoroughly. This suggests the need for their mental observation and study.

By those who urge the psychiatric study of the lawbreaker it is not held that it will serve as a cure-all. The demonstrations in the business world, clinics, schools and institutions have shown that psychiatry, when cautiously and conservatively utilized, can do much to analyze and explain the conduct of individuals.

The mental study and treatment of the offender offers the only hope in sight for a different approach to the treatment of the offender. If it cannot give us helpful clues as to the causes of anti-social conduct, and if it cannot eventually develop definite lines of treatment and cures to a degree which will justify its existence, then we must admit the absence of progress and almost failure. The institutional treatment of the offender will then remain, as it always has, nothing much above the level of a temporary detention system, and thereby offer only limited protection for society.

Unfortunately, there is abroad the feeling that the mental study of the offender means that there will be an excuse found for almost any form of anti-social conduct, which will result in the letting off of the guilty person and practically the condoning of crime. That, however, is not in accord with the best minds, programs and practices.

The State of New York has long ago recognized the need for the special treatment of the mentally defective delinquent through the

establishment of a separate institution at Napanoch, the only one of its kind in the country. To that institution it is possible to commit persons so that they will be held for life if, in the judgment of qualified persons, their mental condition justifies such action. This, of course, is only the beginning and a part of a program which might include the reclassification of the prisons, and of the prison population, based upon the mental and other study of prisoners, and extend to the courts in determining fitness for the placing of persons on probation. In other words, the psychiatric treatment of persons accused of crime is worthy of a thorough trial, and to that end should have the benefit of public patience, confidence, and whole-hearted support.

CERTAIN DEFECTS IN THE DETERMINANT SENTENCE SYSTEM

BY WALTER N. THAYER, JR., M. D., SUPERINTENDENT, INSTITUTION FOR DEFECTIVE DELINQUENTS, NAPANOCH, N. Y.

The law governing the Institution for Defective Delinquents should be amended so as to clarify the matter of parole jurisdiction of inmates committed to us directly from the courts. The law seems to give us definite parole powers, but its validity is called into question by the courts of Greater New York, which do not deem a commitment to Napanoch to be a disposition of the indictment, whether the commitment has been made before or after conviction. We are required, in all these cases, to return the individual to the jurisdiction of the court, which proceeds either to suspend sentence and release the man on probation, or to pronounce sentence and cause him to be incarcerated in a correctional institution. As I assisted in drafting this law, I know it was the intention of the Legislature at the time to permit the parole of such individuals directly to the community.

The attention of the commission is called to the lack of provision for the commitment of insane inmates to State hospitals. We are having the utmost difficulty in securing action by the courts of original jurisdiction when an inmate, committed directly from the courts, is found to be, or becomes, insane. I have several of these men at the institution at the present time, and it is felt that the

committing court should relieve the institution of their care, and commit them to a State hospital for proper care and treatment.

On general grounds, I would call attention to what seems to me to be the absurdity of having various degrees of larceny and burglary defined by the law. The crime of larceny, as at present defined, is designated as petit or grand larceny, dependent upon the value of the loot purloined by the thief, and this value represents whatever amount was available at the time he committed the theft; in other words, he is receiving credit for circumstances over which he has no control. The crime of burglary, as I recall it, differs in degree according to the time of day and the circumstance under which the crime is committed. The attempted but unsuccessful crime (and surely no one should allow the criminal to derive any credit for an unsuccessful attempt at crime) carries with it but half the length of sentence attendant upon the successful crime.

Difficulty is encountered in the enforcement of the Fourth Offender Act, which makes it mandatory that the convicted criminal be sentenced to life imprisonment with no prospect of release except by executive clemency. I believe the psychology of this act to be wrong, and that we will continue to find juries, courts and prosecuting officials who will hesitate to convict for a minor degree of felony when they know that such a conviction will carry life imprisonment with what is popularly considered to offer no hope of release. I am thoroughly convinced of the wisdom of the indeterminate sentence, and I feel that, in the case of the habitual criminal, the law should be amended to permit of the infliction of a minimum sentence of sufficient length and severity to satisfy the public that the man will be punished for his act, and to be a deterrent to others; but I believe that there should be either no maximum, or a life maximum sentence. In either event, it would be possible to continue the segregation of the habitual criminal until it was felt that he could be trusted to go on parole with a reasonable expectation of an effort on his part to comply with the rules of society. I believe such a law would be more easy to enforce, and that it would hold out some inducement to the habitual criminal to so conduct himself as to make it possible for him to secure release from custody.

I therefore recommend a thorough psychiatric examination of each criminal, and consideration, segregation, and treatment on the basis of the findings of such an examination. I believe such consid-

eration and treatment would average longer in duration than is experienced where the determinate sentence system is used. I might say parenthetically that I am in accord with the Governor's suggestion of a sentencing board, provided the habitual criminal act cannot be amended as above suggested, in which event such a board would almost seem to be unnecessary, unless it was to be used as a parole body as well as a committing or sentencing board.

NOTES ON CERTAIN ABUSES OF PSYCHIATRY IN THE FIELD OF CRIMINOLOGY

BY SYLVESTER R. LEAHY, M. D., NEW YORK CITY

First, that physicians who are not psychiatrists are being appointed to commissions both in New York and Kings County by the judges and are passing on mental conditions of criminals.

Second, persons alleged to be insane are not being transferred from the county jail in Brooklyn to the observation ward as the law provides.

Third, that we still have to retain the idea of *knowledge and responsibility* in mental disease as a criterion.

Fourth, that there are a large number of constitutional psychopaths who are chronic repeaters and that these should be referred to special State institutions in accordance with the Mental Hygiene Law.

Fifth, that there are many consulting psychologists and lay analysts who are trying to impress the public with their fortune-telling powers along vocational lines, and that these should be prevented from doing this sort of work.

Sixth, present criminal activity only stresses the need of mental clinics to examine problem children in order to readjust them early in life before they become social menaces.

PSYCHIATRIC STUDY OF SCHOOL CHILDREN, AN AID TO CRIME PREVENTION

BY JOHN R. HARDING, M. D., PSYCHIATRIST, NEW YORK STATE REFORMATORY, ELMIRA

A close study of the situation reveals the fact that the prison is the community's last resort. When home and school and church and social betterment and probation have all failed then the offender must be deprived of his liberty and reformed (if possible) by

force. The prison is at the wrong end—its inmates have already developed delinquency and become habitual offenders.

The first opportunity we have to deal with problem cases is in connection with the public schools. Your speaker has been psychiatrist to the Elmira public schools for the past eight years. During that time some five hundred backward and abnormal children have passed through this laboratory. Here a trained school nurse goes into the child's home and gathers a full history of the ancestry, birth, early life, and environment, and records same on a uniform questionnaire. Another blank is filled in by the child's teacher. In this way much valuable information is gathered that could scarcely be obtained in any other way, for during this period of life every child is under the complete control of the school authorities and may be studied and tested at will.

The advantages of testing and recording these "problem children" are great. In the first place the community is furnished with a close-range study of the child's mental and social defects. At Elmira the judges, the recorder, and the probation and humane officers all have access to these records and consult them frequently. It also enables the authorities to commit anti-social children to State schools or other correctional institutions when they do not respond to early probation. By recognizing and committing these incorrigibles before they become full-fledged criminals the community is saved from much ravage and plunder and murder, and also thousands of dollars in court fees.

Perhaps the greatest advantage of a study of atypical children while in school is to the teachers themselves. A knowledge of the mental age and I. Q. of the backward child is invaluable in the classroom. It determines at once whether the child is able to learn grade work, or whether he should be transferred to a special class. At Elmira there are seven of the special classes with 105 children assigned (15 to each teacher).

Another interesting experience of your speaker has been as clinic examiner at State clinics for abnormal children. These clinics were sponsored by the late Commission for Mental Defectives, and perfected and greatly extended by Dr. V. C. Branham, at that time psychiatrist to the commission. Nearly every section of the State now has its monthly clinic, and the function here is similar to that of the Child Study Clinic at Elmira.

At the Elmira Reformatory a department of research has been in operation for several years past. Here every inmate admitted to the institution is tested and examined and his record filed away. More than 8,000 such records are on file at the institution.

A transcript of these examinations is furnished the different heads of departments and is used constantly in dealing with problem cases.

The speaker believes that every public school system and every prison should have a resident psychiatrist, and also that the department of research should be consulted whenever there is any trouble with discipline or school or progress, or with the mental health of the inmates. In no other way can a prisoner always get a just and satisfactory decision.

Whether in the school, or the community, or the correctional institution, the abnormal individual is always a problem; and the only real way to get at him is through psychiatry. As previously intimated, the public school offers the only real opportunity to test and record the eccentricities of our atypical children. Your speaker believes that every school system should weed out the incorrigibles and get them into correctional institutions, and then reclaim the dullards and truants as far as possible through special class training. In this way the next generation will be spared the burden and ravages of many a young criminal. For crime is seldom a spontaneous affair. It begins in the nursery and matures only after years of home-pampering and neglect, and of loafing and petty pilfering and dissipation.

THE PSYCHIATRIC CLINIC OF SING SING PRISON

BY AMOS T. BAKER, M. D., PSYCHIATRIST, SING SING PRISON

We examine all cases for parole and make a report of the same in some detail to the State Parole Board. We see all new cases coming to the prison, selecting those for examination who appear suspicious to us in any way. We attend the intramural court every week and observe the prisoners brought before this court to learn what charges were lodged against them. We, also, attend the meetings of the assignment board. This board assigns prisoners to work in various parts of the institution. We hope, with the aid of appropriate vocational tests, to be of value to the institution in selecting the proper job for each inmate.

We feel that a psychiatric clinic in a penal institution has a threefold value.

First. To the prison authorities by taking care of those cases which do not properly belong in the prison on account of mental disorder or mental defect. To acquaint the prison authorities with the characteristics and make up of other abnormal characters who are found among the prison population.

Second. To be of value to the prisoners themselves by talking over their difficulties and helping them to make proper adjustments in prison and possibly proper adjustments on the outside.

Third. Research work. As a result of examinations and investigations to make some contribution to the causes of delinquency, if possible.

A case of a mental defect is mentioned to demonstrate the value financially of psychiatric work in connection with delinquents. This case was examined in a laboratory some ten years ago. At that time it was felt that he should be segregated. It was reported recently that this mental defective who was not segregated, set fire to some buildings, endangering the lives of a number of people and causing a property damage of $100,000. The cost of maintaining the laboratory was $18,000 a year.

RECENT TRENDS IN THE GIVING OF EXPERT TESTIMONY

BY LEO J. PALMER, M. D., SUPERINTENDENT, NEW YORK STATE REFORMATORY FOR WOMEN, BEDFORD HILLS

It would seem that the consensus of both professional and lay opinion is fast crystallizing with respect to the relationship of psychiatry to law and the criminal. In spite of sporadic tabloid distortions of the alienist's features of some of the recent criminal cases, we do find that court room controversies between medical experts in matters of mental status are occurring less frequently. This, to some extent, is due to the fact that qualified experts in mental disease retained by both prosecution and defense have made joint examinations and have satisfied themselves of the sanity or insanity of the prisoner previous to trial. In several recent instances, this occurrence of opinion has wholly eliminated the question of the legal responsibility of the prisoner from the trial and permitted the question of guilt to be determined solely on

the facts of the case. Both from the pecuniary value and that of the ends of justice, this is by far the more idealistic and practical procedure. Most of us have undergone the experience of opposing the opinions of so-called mental experts, who in fact were general practitioners or specialists in other fields of medicine, yet, on the strength of a previous connection in some criminal case and with the aid of a textbook on psychiatry, they have been able to qualify as mental experts. It is this type of expert who brings unfortunate and misdirected criticism to the specially trained group of mental experts and is instrumental in prolonging medico-legal cases indefinitely.

In spite of such necessarily brief discussion it should appear that to eliminate the appearance of partisanship when mental experts are called to oppose one another during court trial the mental status be determined previous to trial and to the satisfaction of a majority of at least three qualified psychiatrists. And furthermore, that definite steps either legislative or otherwise taken to determine who may qualify as experts in mental disease or as alienists.

In addition to the foregoing, it seems timely to entertain the thought of what is rapidly becoming the modern concept of the disposition of the prisoner after his guilt has been determined. Those of us who have been engaged in psychiatry in the penal institutions of the State are only too familiar with the many prisoners showing mental aberration that are being regularly committed to our correctional institutions with definite sentences—to be released unconditionally at a definite time—regardless of their attitude toward society at that time. Many of these are our chronic offenders or habitual criminals. We do know that they will return but we dare not hazard a guess as to what they will do before they again fall into the hands of the law. In passing, I might refer to this group as those who are definitely lacking in social intelligence; the neuropathic class made up of psychopaths, epileptics, psychoneurotics, etc., and the potentially psychotic. Statistics disclose that these groups constitute well over 50 per cent of our prison population.

The necessity for brevity in what could well be unlimited discussion brings us to the question of practical disposition of the problem. Consensus of opinions of those engaged in criminological fields would indicate that solution lies essentially in the establishment of legislation providing for psychiatric classification of all

convicted criminals, immediately following conviction and psychiatric case studies at the disposal of our parole boards in whom would be invested the authority of recommending further segregation for those prisoners who for behavioristic reasons are not adaptable to extra institutional residence.

THE NEED FOR INDIVIDUAL GUIDANCE OF CHILDREN

BY ROWLAND C. SHELDON, EXECUTIVE SECRETARY, BIG BROTHER AND BIG SISTER FEDERATION, INC., NEW YORK CITY

The Big Brother and Big Sister Federation endorses very heartily the use of capable psychiatrists in local case-work.

The federation by its studies has determined that the most profitable place and time to reach children with the idea of preventing delinquency and later crime, is in the 5th, 6th and 7th grades of the public secondary schools among children in the pre-adolescent and adolescent ages.

The symptoms that would indicate to us the children needing attention are: irritability, anemia, mental retardation, physical defect and emotional instability.

We feel that if such children can be referred to a child guidance clinic for analysis, prognosis and program, and if the child can then be referred to a competent Big Brother or Big Sister organization with a trained experienced executive, and carefully chosen and trained volunteers, it will be possible during a three or four years' follow-up to carry out the recommendations of the psychiatrist.

We feel that the program is better confided to properly qualified and trained amateurs rather than to professionals, as the former are necessarily devoid of technique, both in vocabulary and manners.

We feel that approximately one per cent of the boy and girl population of a city having a population of 30,000 or over will be in need of individual, personal and intensive effort in order to avoid serious consequences.

Is it not possible that a child having the characteristics enumerated would become psychopathic, and is it not possible to prevent this condition by psychoanalysis, medication, dental, optical and surgical prescriptions and correction of parental attitude as well as a change in environment?

We are working on this hypothesis and at present are reaching through 751 groups approximately 50,000 children a year, of which number 65.8 per cent are pre-delinquent; 26.9 per cent, court cases; and 7.3 per cent, after-care cases.

Seven and seven-tenths per cent are under the age of 10 years; 65.2 per cent, between the ages of 10 and 16, and 17.1 per cent, over 16.

The organizations from which we have received full reports state that only four per cent have been arraigned in any court during the year since they were listed with the Big Brother or Big Sister Organization.

The average annual per capita cost is $15.92.

Studies of delinquents and truants made in several cities indicate that exceedingly few have ever been in touch with such character building organizations as the Boy Scouts, Girl Scouts, Y. M. C. A., Y. W. C. A., boys' clubs, and churches; we feel that perhaps 99 per cent of the children could be reached by these organizations but that there is a one per cent that cannot be reached through any group activity and that must be reached individually, personally and intensively.

That program would involve in the United States approximately 224,000 children.

It is worth note that this is approximately the prison population of the entire United States.

In this discussion we have concerned ourselves only with the problem child and we have purposely failed to mention the service the Big Brothers and Big Sisters render to the child who *has* a problem.

SUGGESTIONS FOR SECURING BETTER PSYCHIATRIC EXAMINATIONS OF DEFENDANTS

BY EDWARD E. HICKS, M. D., BROOKLYN

1. Abolish all lunacy commissions.

2. Use psychopathic hospitals (where prison wards are maintained).

In counties where none exist send the alleged insane criminal to Matteawan Hospital. Or, as Dr. Kieb suggested before the Baumes Commission, send all cases for observation to the State hospital at Matteawan for observation and diagnosis.

3. Personally I feel that persons charged with felony should be tried on the merits of the case or charge and after this the psychitric examination should take place; the reason being that if any person commits a serious crime while insane he is always a menace at large in any community; and if such convicted person is found to be insane, or was insane at the time of the commission of the crime, he should be placed in the hospital for the criminal insane until he recovers. If he recovers he should be transferred to a prison and be removed from society forever.

4. In those cases in which a person is charged with a felony and is acquitted by a jury and there is sufficient reason to believe that the individual is insane there should then be a psychiatric examination and if the said individual is found to be suffering from any mental disorder, he should be transferred to one of the civil State hospitals for treatment. These examinations should be made at a psychopathic hospital in any city that maintains one; if there is none available the individual should be transferred to a State hospital for observation and diagnosis.

5. It is my judgment that the law should be changed as to the qualifications for examiners in lunacy. When the State allows a physician to examine and commit the insane, said physician should have some psychiatric training in order to qualify. How extensive the training the examiner should have should be determined in the proposed legislation by competent psychiatrists men of broad experience and good judgment. In fact the recommendations that I have made should be carefully weighed together with all recommendations, by a committee of at least three psychiatrists, outstanding in experience who should be active aids in framing such measures as the Commission should desire.

PSYCHIATRIC EXAMINATIONS OF PRISONERS IN MASSACHUSETTS

REPORT OF DISCUSSION BY WINFRED OVERHOLSER, M. D., DIRECTOR, DIVISION FOR THE EXAMINATION OF PRISONERS, MASSACHUSETTS DEPARTMENT OF MENTAL DISEASES, BOSTON, MASS.

Dr. Overholser called the attention of the Commission to the Massachusetts Act of 1921, as amended by the Massachusetts Acts of 1925, which made it mandatory upon clerks of the court to report to the Department of Mental Diseases of persons accused of:

(1) Murder in the first degree;
(2) Persons indicted or bound over for a felony who
  (a) have been previously convicted of a felony, or,
  (b) have been previously indicted for any other offense more than once.

This act provides for the Department of Mental Diseases to assign two psychiatrists for the examination of prisoners and to report regarding the existence of any mental disease which would affect his criminal responsibility. A fee of $4 only is provided. The report itself is not admissable as evidence, but of course, the psychiatrists are subject to examination.

Dr. Overholser reports to the Commission that to date (October 15, 1927) 505 cases have been reported to the Department under this law, of which 123 were not examined. Of the 382 examined, 85 (22 per cent) were found to have the following classifications: 31 insane; 34 mentally defective; 12 psychopathic personality; 8 recommended for commitment for observation.

Dr. Overholser admitted that the provisions of the law were not being completely carried out but that it had thoroughly justified its existence. It is providing for routine examinations by psychiatrists who are impartial and has done away with the conflicting testimony of experts or commissions in the ordinary murder trials. Furthermore, a great expense has been saved the counties by doing away with protracted trials. Court officials are looking with favor upon this procedure and are, in many instances, getting a psychiatric viewpoint.

NEED FOR ADDITIONAL CLINIC SERVICE

BY V. C. BRANHAM, M. D., MEDICAL DIRECTOR, NEW YORK STATE COMMITTEE ON MENTAL HYGIENE

The ultimate purpose of the hearing which the Baumes Crime Commission has given to this group of psychiatrists seems to be the assurance that the Commission will adequately present in its report to the Legislature the psychiatric aspects of the prevention and treatment of crime. It has been felt that this point has not received hiherto the emphasis which it deserves. Of fundamental importance is the idea that it is the desire of the psychiatrists to secure a thorough study of such cases as appear to be recidivistic.

This examination will not only bring out information as to the fundamental mechanisms in operation in the personality make-up of habitual criminals but will secure a means for better treatment for them and above all a more efficient protection to the community. It would seem advisable to indicate clearly to the Baumes Commission that psychiatry does not stand for the indiscriminate freeing of prisoners on the plea of insanity nor have any sentimental attitude which would be the means of subverting justice. In the ultimate analysis psychiatry stands for a much greater protection of the community than does the present method of assigning prisoners on the basis of the first terms of commitment inasmuch as psychiatry provides a means for a thorough study of individuals so that large groups of them can be segregated for a long period of time.

Steps have already been taken in this direction in New York State and it has proved to be of great practical value. Reference is made in this connection to the Institute for Defective Delinquents at Napanoch which provides a means for permanently segregating habitual offenders who are feebleminded. A similar division has been created for feebleminded women at Bedford Hills. The State hospital at Dannemora and Matteawan provide facilities for prolonged detention of the criminally insane. It should be made evident to the Baumes Commission that there still exists outside of the two groups just mentioned, certain classes of psychopathic criminals who need prolonged detention and study. In a certain sense the Baumes' Law for the life imprisonment for fourth offenders covers a limited number of these criminals inasmuch as they are recidivistic and probably in many instances pathologic in make-up. It is believed, however, that the method of selection these men through a scale of a number of offenses committed does not meet the situation so fully as is possible by making the selection on the basis of psychopathic elements involved. It should be pointed out to the Baumes Commission that the present facilities for study of the group just indicated is not extensive enough to cover all types of criminals and that the situation resolves itself into the following status.

The prisons have a means for the study and classification of prisoners after commitment. While there are a number of isolated instances of the study of prisoners before commitment this has not

by any means been a generalized procedure throughout the State. Accordingly it is advised that the Baumes Commission incorporate in its report to the Legislature the following recommendations:

1. That a clinic be established in connection with the Magistrate's Court of New York City for the purpose of examining selected cases which would seem to need more prolonged study and care than is given under the present arrangement. It is a well recognized fact among psychiatrists that psychopathic tendencies in the cases coming before the Magistrate's Court are much more prevalent than among prisoners committed on more serious offenses. This project will have to be supplemented by additional facilities for prolonged detention in connection with the prison systems.

2. That a clinic be established in connection with the Court of General Sessions of New York City for the purpose of examining cases which are placed on probation or suspended sentences without actual commitment to prisons. Many of these cases could be studied and readjusted so that they would not commit further crimes. At present there is no system for the examination of such individuals since they are not sent to the prisons.

3. That a traveling psychiatric unit be created consisting of a full-time psychiatrist, a full-time psychiatric social worker, and stenographer for the purpose of making periodical visits to the courts and jails throughout the State, examining selected cases which do not seem to be definitely insane but who are extremely psychopathic in make-up. It would be desirable for the State to provide means for the routine examination of all prisoners committed to jails and penitentiaries but at present this procedure would involve too much expense. Groups of especially selected cases should be regularly examined. At this time there exists no facilities for estimating the amount of instability present in such a group.

4. That legislation be enacted to make the foregoing three recommendations effective.

REMARKS ON PERMANENT SEGREGATION OF CRIMINALS

BY HASTINGS H. HART, CONSULTANT IN DELINQUENCY AND PENOLOGY, NEW YORK CITY

The hearing just concluded appears to me to be one of great significance. I think that some of those present may have had an idea that psychiatrists are more or less visionary people, practicing an esoteric science incomprehensible to the ordinary layman, and cherishing a sentimental weakness toward the criminal as an individual to be considered irresponsible and therefore to be treated with great leniency. There has been a feeling in some quarters that psychiatrists are often used by lawyers to defeat the ends of justice.

We have listened to a group of accredited psychiatrists of high standing, and I am sure that their statements are calculated to remove the impressions to which I have referred, at least as far as these men are concerned. I was interested when a member of the Crime Commission said to me this morning: "These men seem to want the same things that we want." I was interested also in the significant statement made by one of the expert speakers: "The chief qualification for a psychiatrist is practical common sense."

It must be remembered that psychiatry as a science has been applied to practical dealings with the criminal for a very brief period—less than twenty years. The use of psychiatric tests and psychiatric treatment was discredited in the early stages of this movement by the fact that many young people after taking a six-weeks course in Philadelphia or Vineland would immediately set up as expert psychologists and proceed to pronounced judgment upon the mentality of children, right and left, in a most reckless and destructive manner; but that period, happily, is over. I have been interested to note that it has been the general testimony of judges, prosecuting attorneys and prison wardens in places where competent psychiatrists have been installed that they have found this service of great assistance in dealing wisely and justly with accused persons and sentenced persons who have come within their jurisdiction.

It was, perhaps, a matter of surprise to some of the members of the Commission to learn that the psychiatrists agree heartily with the views of this Commission as to the permanent segregation of

habitual criminals; but there appears to be an important difference of opinion as to the tests whereby the fact of habitual criminality should be determined. The Baumes law provides that an individual convicted the fourth time of crime must be sentenced to prison for life. The psychiatrists believe that the test should be not the number of convictions but a thorough study of the individual to determine what is his character and disposition, whether he is fixed in his non-social attitude, and also whether his criminal acts are due to a defective mental condition. (It should be remembered that an individual convicted for the first time of burglary, highway robbery, or forgery is not likely to be a first offender, but has probably committed similar crimes over and over before his first arrest.) The psychiatrists go much further than this Commission because they hold that if the individual is shown to be dangerous to society because of his criminal character or mental defects he should be segregated just as soon as that fact is determined, whether he may have committed one offense or forty. They do not believe that we should wait until a firebug has been convicted four times of arson, or a rapist has been convicted of four offenses against little girls or women before shutting him up for life; but, on the other hand, they believe that individuals who are mentally defective should not be incarcerated in State prisons or adult reformatories, but should be sent to a hospital for insane criminals, or an institution like Napanoch which is especially organized for the treatment of defective delinquents.

To my own mind there is something quite inconsistent in the public thinking as to the justice and propriety of holding confirmed criminals for life, or at least as long as they continue to be a menace to the community, when we do not hesitate to segregate innocent persons permanently for the protection of society.

It appears from the testimony to which we have listened today that when an individual is suspected of being insane a petition is filed in the County Court and the judge calls a commission of two physicians who frequently have no technical knowledge of the subject of insanity. If, after a cursory examination, these two physicians, together with the judge, and without further examination or jury trial, agree that the individual is insane, he is committeed to a hospital for the insane—for how long? Until he is cured. And

multitudes so committed are detained for life. If information comes to the superintendent of the poor that a child is probably feebleminded or epileptic, he may call a similar commission of two physicians, and on their finding that the child is feebleminded or epileptic, it is committed to an institution for an indefinite period. And multitudes of these individuals are detained for life. We justify such detention on the ground that it conserves the welfare of the unfortunate victim, that it relieves his family of a distressing and expensive situation, and that it is a protection to society against the evils which may arise from his unrestricted presence in the community, because a large amount of crime and immorality in a community is promoted through such individuals.

If we can commit scores of thousands of innocent feebleminded and epileptic persons, accused of no crime, to life detention in institutions for the protection of the community, without trial by a jury and without legal counsel for defense, certainly there should be no question of the right of society to give similar treatment to confirmed criminals, after trial by a jury of twelve, under the protection of the court and counsel.

THE INTER-RELATIONSHIP OF PSYCHIATRY AND SURGERY

BY WILLIAM SEAMAN BAINBRIDGE, Sc. D., M. D., C. M.
NEW YORK CITY

There are numerous reactionary theories today regarding the determining cause of many types of psychoses and it is not the purpose of this paper to add a new list of possible causative factors in mental disease to those already tabulated. The main purposes of this treatise are, first, to emphasize the close connection between certain physical ailments and certain of the psychoneuroses and to confirm as far as possible the fact that the surgical removal of abnormal physical conditions frequently will relieve mental phenomena in part or, sometimes, even completely; second, to stress the importance of a more general appreciation by the surgeon and physician of the part *mind* may play in the prevention and cure of disease, and the necessity of the psychiatrist's aid in many *apparently* physical conditions.

It has long been known that various mental manifestations are associated with physical disorders, but in spite of a recognition of this fact, it is not unusual to find patients accredited with a speculative *mental* pathology when the true cause behind the psychosis is an abnormal *physical* condition. In examining each case, therefore, one must take every known precaution to establish the diagnosis with all possible accuracy. We must consider that (1) each mental case is first of all a human being and is subject to any physical ailment common to the mentally sound division of the human family. General adequate medical and surgical care are even more essential to the patient with psychopathic personality than to the individual of normal mentality. (2) It is equally true that any patient who has a physical condition which requires medical or surgical attention may develop, concurrently, an added mental condition which is simply a reflex of the physical phenomena. (3) Again, the patient with a true psychosis may have developed the mental pathology through an underlying physical condition demanding medical or surgical attention. (4) Accentuation of a physical ailment may be due to the strain of an added psychopathic element and the medical or surgical correction of the physical phase may improve both mental and physical aspects of the case. White

(W. A.) says: "A great deal of what heretofore has been regarded as constitutional, that is, hereditary, is now regarded as individual and due to causes which are at least preventable."

Mind and body are interdependent organisms and it is impossible to state the precise point at which the well being of one is affected by the well being of the other. We have been impressed, however, by the relative frequency with which mental disorders occur in association with particular foci of infection—sinuses, teeth, tonsils, thyroid gland, intestines, ovaries, etc.—and it is to emphasize the coexistence and apparent interdependence of these physical and mental manifestations that we present the cases reported below.

Well defined mental reactions frequently are associated with many of the infections and toxic diseases. Mental symptoms (excitement, depression, hallucinations, catatonic states) are often identified with typhoid, smallpox, malaria, influenza and septic poisoning and these may disappear following the elimination of the infection. Menninger calls attention to the relation between mental disorders and influenza.. He say: ."Influenza may *cause, alter* or *modify* a psychosis." A definite psychosis has been known to clear entirely following a severe attack of the "flu."

Cardio-vascular disease may be accompanied by mental hallucinations and confusions as the result of compensation disturbances. Renal and genito-urinary infections are associated, as we know, with mental abnormalities and the elimination of the foci of infection, frequently may restore the mental status of the patient.

Many toxic epileptiform seizures (those of alcohol, lead, uremia, albuminuria, indicanuria, etc.) can scarcely be distinguished from essential epilepsy. In the case of apparent epilepsy herein reported, there is no question but that the toxins were produced in the alimentary canal.

The writer has encountered many cases of so-called hystero-epilepsy (occuring in relation to the menstrual period) and in many of these the seizures have been lessened in severity and frequency or entirely eliminated following a pelvic adjustment or repair. During the involution period, it is evident that a constitutionally predisposed person, who has escaped a psychosis in earlier life, is apt to develop an agitated depression during the period of regression, particularly under added mental strain or with the additional handicap of a toxic condition.

Mental disorders which occur during puerperium are usually of toxic origin. Williams says: "Every portion of the maternal organism reacts to a greater or lesser extent under the influence of pregnancy." In many of these cases there are hereditary taints in the forebears and others are under *par* physically during the pregnancy, but most of them have definite toxic factors preceding the psychosis. In an extensive study of psychoses in connection with child birth, Kilpatrick and Tiebout found no psychosis *peculiar to puerperium*. The psychoses occurring at this time are essentially the same as the psychoses occurring at other times and when the infection is eliminated in these cases, as in other toxemias, the mental status is restored.

Since psychoanalysis has become of some importance in the world of medicine, one must consider the influence of sex on mental reactions, even in surgical cases. Unsatisfied functional craving, associated with an exhaustion, or a toxic element, may form a combination from which a mental breakdown is the inevitable result. While Freudism and psychoanalysis in general have been so exploited that a reference to a "sex complex" may not always receive the serious attention it warrants, nevertheless it is evident that a sex complex may prove to be either a contributory or an essential cause in a mental breakdown, or a handicap in a surgical or mental condition. Therefore, when we are considering the removal of an area of infection, or the treatment of a toxicosis, in a mental case, we must reflect that, while the surgical removal of the site of infection may restore the mentality to nine-tenths normal, the elimination of the sex complex, or any other complex, if such is present (by psychoanalysis, or any psychological process) may contribute the other one-tenth required to make the cure complete.

The first case herein reported illustrates a patient capable of carrying a terrific mental strain without noticeable effect, but when an element of toxicosis is added, the characteristic symptoms of mental breakdown may be apparent. Conversely, the patient may continue to carry a chronic condition of toxemia indefinitely, due to an acquired immunity, often found in chronic cases, but an added mental strain may precipitate a psychopathic reaction.

C. J. Male; 45 years of age; married; two children. A commander in the

U. S. Navy and served as executive officer on one of the largest U. S. transports during the World War. The patient was strong mentally and physically, with no discoverable mental or nerve taint.

He was under continuous strain and this nervous tension apparently told on him to such an extent that he went to pieces emotionally upon the least provocation. Finally, his mental condition became so alarming, after a collision at sea, that the captain, by advice of the ship's surgeon, ordered him off duty and to his room under guard. There were marked hallucinations, mental confusion and severe mental depression.

A thorough physical examination revealed that there were several abscessed teeth present and that the sinuses were infected. The patient was ordered to the hospital, when the ship reached port; the teeth were extracted and, under treatment, the sinuses cleared. As soon as these foci of infection were eliminated, the toxic psychosis slowly and completely disappeared and, after many months, the man was finally discharged from the Washington Naval Hospital, *cured.*

H. L. German; male; 38 years of age; married; merchant. Common school education, average social standards; denies venereal disease; one child died in infancy. Frank; open; quiet, and trustworthy; interested in occult subjects.

He had kidney trouble for ten years and during the last four had been taking morphine, at intervals, to relieve the pain. Fourteen years earlier, he first heard voices, but they only amused and interested him. Gradually, the voices became worse and he was annoyed and complained. For six weeks he lay in bed and refused to eat. He complained of headache; was very restless and excited; said mental telepathy was practiced upon him. Morphine weakened the voices. He claimed that people followed him, passed remarks about him and that he was being poisoned.

Admitted to Manhattan State Hospital, N. Y., March 16, 1926, with pronounced psychosis. The patient was undernourished, tremulous, complained of pain in the right side of chest and back.

May 20, 1926, kidney stone was diagnosed. He was operated upon July 8, 1926, and a large stone was removed from the pelvis of the right kidney.

He showed immediate mental improvement and by August 14, 1926, the hallucinations had disappeared and he was paroled, practically free from all symptoms. September 3, 1926, he returned to Alabama and resumed his business. November 1, 1926, he was reported perfectly well.*

E. W.; male; 43 years of age; single. The patient had a brush burn of left shin. It became ulcerated and infected. There was marked extension with swelling about the knee. The infection continued to spread, and operation was advised. Wassermann and Kahn tests negative.

* Service of Dr. Henry Stern, of the urological staff, Manhattan State Hospital, to whose courtesy I am indebted for the case report.

A lateral incision, both sides of patella of left leg was made; also linear incision on the inner side, entering popliteal space. There was a great deal of pus and some necrotic tissue. The ulcer was curetted.

The laboratory report of cultures taken from the wound showed: "Streptococcus hemolyticus and staphylococcus aureus present in great numbers." In the cultures taken from the sputum there were myriads of streptococcus hemolyticus; straphylococcus aureus; pneumococcus. There was a disseminated infection process of the leg, general sepsis, and congestion of both lungs at the base. The myocardium was showing the effects of the condition in a weak and rapid heart.

Following operation, the patient showed marked mental symptoms. He became restless and sleepless to such an extent that he resisted hypnotics, even one-third grain of morphine-sulphate, as well as other hypnotics, proving ineffective. He was unmanageable, his symptoms strongly indicating a sex complex.

At this point it was decided to have a psychiatrist and Dr. C. Floyd Haviland, superintendent of Manhattan State Hospital, was called in.

Dr. Haviland's report, in part, follows:

"When the patient was first seen he was in a state of muscular rigidity; depressed and mildly apprehensive.

The patient was of artistic temperament; was active and a good worker; pleasure loving and denied himself nothing. He humored himself and avoided adult responsibility. The patient's mental condition, following operating, was in the nature of a panic reaction to a situation wholly beyond his control."

Treatment consisted of establishing the patient's confidence in his ability to successfully cope with his impulses. Through the use of suggestion *only,* muscular relaxation and sleep were secured without the use of hypnotics, and at the present writing, the patient is well on the way to mental and physical recovery. In the judgment of the surgeon, there is a very serious question as to whether this grave type of infection would not have proved fatal in this instance if the aid of the psychiatrist had not been secured as it was.

April, 1927, the patient is in splendid condition, mentally and physically.

In the production of certain mental disturbances, a very important part is played by the thyroid gland. Such mental conditions, undoubtedly, are the result of systemic poisoning due to the exaggeration, the defect in, or the perversion of, thyroid function. Practically all patients with "thyroiditis" have an unstable nervous equilibrium. The mental cases with thyroid dysfunction are usually divided into two classes; those with defective secretion,

myxodema and cretinism, and those with hypersecretion, toxic goitre. "Associated with the physical symptoms of myxedema frequently there is a mental state of stupidity, indifference and apathy, deepening into dementia." There is a gradual failure of memory, lack of power of voluntary attention and slow association of ideas. Sometimes a moderate degree of confusional excitement appears.

In cretinism there is a decidedly abnormal mental state, as well as the physical symptoms. The mental condition is due to lack of development and it may range all the way from complete idiocy to mild grades of imbecility.

Toxic goitre usually is accompanied by a moderate amount of fear and apprehension and it is not infrequently associated with hallucinations of hearing and of vision, perhaps anxious and agitated states, sometimes restlessness, absentmindedness, excessive irritability, etc. The degree of mental disturbance varies with the individual, as well as in different stages of the same disease. In these thyroid cases a psychosis of *specific* type does not seem to exist.

Severe cases of acute thyroidism with active delirium occasionally occur following operation on the gland. White says: "These may be due to the expression of the gland secretion by handling it, with the subsequent absorption."

Surprisingly prompt relief of mental conditions may be noted after goitre operations. However, it is not to be expected that the removal of a toxic goitre, in advanced cases, although it may eliminate the determining factor, will repair mental degeneration which already has been established.

In the following case, the removal of the various sites of toxic absorption not only relieved the mental condition of the patient but reduced the thyroidism to a point where the goitre completely disappeared. Of course, it is impossible to state definitely whether the mental pathology was the direct result of the thyroidism, or was due to a combination of toxic factors. At all events, the interrelationship of the toxemias is evident, and the similtaneous disappearance of the goitre and the clearing of the mental condition would seem to point to a close correlation between the *cause* and the *effect*.

R. M. Female; 28 years of age; married; three children. There was a normal childhood. Menstruation was regular.

October 2, 1925, first consulted me because of severe headaches; enlargement of the neck, and extreme nervousness. The patient stated that she thought she was becoming insane, and her relatives agreed that such was apparently the case. Her personality had changed completely.

Physical condition showed enlarged and cryptic tonsils and a moderate size goitre. There was a slight cystolic murmur at the base of the heart, and intension tremor. The uterus was large, retroverted and retroflexed. The perineum was badly lacerated and there was marked beginning procidentia.

October 14, 1925, both tonsils were enucleated. Adenoids were removed October 25, 1925, a repair operation and a laparotomy were performed. A suspension of the uterus was done and adhesions which were present between the rectum, the uterus and the broad ligament, were relieved. The appendix, which was kinked and full of fecal matter, was removed.

November 25, 1925, on examination, it was found that the goitre had practically disappeared. The nerve symptoms were reduced to a minimum. November 15, 1926, the patient had completely recovered; the goitre was gone. April, 1927, she was in a normal mental and physical condition.

The close association between infections originating in the genital tract and mental disease is thoroughly established. *Syphilis* as the cause of paresis is recognized everywhere today, but the relation of syphilis to mental conditions is scarcely within the scope of this paper. Endometritis is a condition commonly responsible for mental symptoms. In some instances a decided psychosis has been known to disappear following a curettage. In *ovarian* disease the mental reactions may be very pronounced. In psychopathic patients, where the ovaries are badly diseased and ovariotomy would ordinarily be indicated, two widely separated phases of the wisdom of operative procedure must be considered. First, while there is not a doubt that the removal of diseased ovarian tissue may be the means of restoring to normal a patient with a psychosis, it is equally important to bear in mind the value of the ovarian secretion in maintaining the mental balance of the individual. The sudden ablation of the ovaries in a woman who has not reached menopause—without the substitution of ovarian nutrient—may be a dangerous procedure. It is frequently true that while disease may necessitate the surgical removal of both ovaries, reimplantation of a small piece of healthy autogenous tissue (if such can be saved) or transplantation of a piece of homogenous ovarian tissue seems to have a distinct therapeutic value. The role which the organs of

reproduction play in maintaining the mental balance cannot be stated with scientific exactness, but that there is a definite relation between ovarian function and mental equilibrium is conceded by the most thoughtful endocrinologists—and is substantiated in a large measure by the gynecological cases reported below.

H. S. Female; 42 years of age; married; 2 children. The mother of this patient was insane. In 1907, the patient developed a mental condition which, her family claimed, cleared up in a few months. In 1913, she suffered a second mental breakdown. This condition lasted four years. Following her recovery at this time, the patient was considered perfectly normal for a period of five years.

In November, 1922, while attending a theater, the patient became excited and noisy. Her mental symptoms continued and she was finally admitted to the Manhattan State Hospital, December 5, 1922. Diagnosis: Manic-depressive insanity.

On physical examination, the uterus was found to be enlarged to the level of the umbilicus. The patient stated that she had, for years, worn a wire pessary to prevent conception.

Laparotomy was performed April 20, 1923. The womb was filled with a lipomatous mass in the center of which was found the wire pessary. An hysterectomy was done.

Perceptible mental improvement was noted within five months and the condition continued to improve until in September, 1924, the patient was paroled, and discharged, March 12, 1925, recovered. April 1, 1927, she was perfectly well.*

D. G. Female; 27 years of age; married; two children. The first mental upset occurred in 1915 and lasted sixteen months. This followed the shock of seeing a man killed.

The second mental attack, 1923, followed the birth of her first child, and lasted four months. The third attack commenced August 11, 1925. Diagnosis: Manic-depressive psychosis.

Physical examination revealed lacerations of the perineum and cervix; enlarged uterus and a small tender mass in the left broad ligament.

October 20, 1925, laparotomy was performed. There were a prolapsed, cystic left ovary and an appendix bound down by adhesions. The ovarian cyst was removed, the ovary suspended and the appendix removed.

Following the surgical procedure, the mental improvement of the patient was rapid and she was paroled from the hospital a few months later.

J. W. Female; 46 years of age; married; no children. This patient consulted me because of severe pain in the head and neck; extreme nervousness

* Reported in substance by R. G. Wearne, M. D., of Dr. Bainbridge's service. Medical Press and Circular, April 16, 1924.

and a vaginal discharge. We learned that the patient had used a good deal of alcohol from time to time.

On examination a large multiple abdominal tumor was found to be incorporated with the body of the uterus.

Laparotomy was performed April 27, 1926. The fibroid tumor, which was the size of a five months' pregnancy, was adherent to the rectum. The pelvic colon was adherent to the mass, by means of two large appendices epiploices, to the left broad ligament and to the bladder. Both tubes and ovaries were a mass of adhesions. The uterus and ovaries were extirpated.

The last kink of the intestines was accentuated; the appendix was kinked, underhung and contined some small concretions. The intestinal kink was corrected and the appendix removed.

After the peritoneum had been closed, in the outer edge of each rectus an opening was made down to the deep epigastric artery and the healthy portion of each ovary was implanted behind the rectus.

After operative procedure, the patient, who had not been allowed any alcohol immediately preceding or following operation, developed a psychosis. She had hallucinations; was very resistive and disturbed and very difficult to manage.

Dr. Graeme Hammond, who was called in consultation, diagnosed the mental condition as exhaustion psychosis, due to the combination of surgical shock and deprivation of the usual alcohol.

The mental condition was very marked for several weeks following the operative procedure but, with the improvement in the physical aspects of the case, the mental disorder gradually cleared until the psychosis completely disappeared.

In this case, the patient might have carried the alcoholic toxicosis without any untoward results but as soon as the extra strains (the surgical shock and the deprivation of the alcohol) were imposed, the mental pathology developed. April 1, 1926, the patient was perfectly well.

E. A. Female; 44 years of age; married; one child. Patient's husband stated that she was always in good health until eight years previous to the present psychiatric examination. Her first serious illness resulted from an infection of the pelvis following a miscarriage. The history seemed to indicate that this infection was severe and the patient extremely toxic for a considerable time following it. At the time of the original infection, there was a definite nephritis and this condition apparently never entirely cleared. However, the patient showed no particular mental trouble until a few weeks previous to the examination at which time she developed a hemiplegia which was followed by a definite organic mental syndrome. This syndrome included loss of memory, periods of confusion and disorientation. The men-

tal condition continued to develop until the patient showed definite organic mental deterioration; her emotional status was unstable. At times there were periods of confusion which approached a definite organic delirium.

Psychiatric diagnosis: "This history, plus the mental symptoms observed, plus the neurological signs of an old hemiplegia, plus general arteriosclerosis, with high blood pressure, without positive Wassermann, would seem to leave no doubt that the diagnosis was cerebral arteriosclerosis."

Finally the patient developed such a serious mental condition that it was necessary to place her under restraint in a sanitarium. Chronic deterioration followed. The patient became worse mentally and finally died May 8, 1923.

Dr. I. J. Furman, then of the Manhattan State Hospital, who was consultant in this case, says: "It is my opinion that the severe infection from which this patient suffered eight years previously was the remote cause of her mental illness, inasmuch as she developed her arterioclerotic condition gradually and showed such an advanced stage of this disease affecting the brain at the early age of 44."

Perhaps by far the most significant site, in the human body, for the absorption of toxins is the intestinal canal. Frequently, as the result of the damming back of fecal material in the canal, chemical or bacterial absorption in abnormal degree occurs and one of the first indications of this process is its effect upon the nervous system. Alimentary toxemia is generally conceded to be one of the chief factors in the production of such conditions as neurasthenia, epileptiform seizures, so-called neuritis, etc.

A very interesting theory to account for these conditions of stasis of the intestines, with, in many instances, resultant auto-intoxication of the patient, is that of Sir Arbuthnot Lane of London. According to this theory, the mechanical relations of the alimentary tract, particularly of the large bowel, are changed in consequence of the assumption by man of the upright posture and, as a result of this posture, there develops a tendency to general and persistent enteroptosis. Nature attempts to relieve the strain of this enteroptosis and thus the dragging of the displaced bowel is offset through a hypertrophy of its membraneous supports—veils, bands, etc. In some patients the result of the abnormal delay in the passage of the intestinal contents—intestinal stasis—may be the sole productive factor in the mental pathology. This condition of intestinal stasis may be relieved, in its early stages by such moderate

surgical procedures as cutting bands, replacing hollow viscera, changing angles, etc. However, there are many cases of advanced type, which may have been neglected for years and these require more radical operative measures. After careful preliminary study of each case and a thorough investigation of the actual conditions as seen upon the operating table, the operative procedure best fitted to the individual case will be evident.

In many of these conditions, the result on the mental state, following operative interference on the intestinal canal, is extraordinary. With the relief of the kinking or the angulation of the gut, free drainage of the intestinal canal is established, the symptoms of auto-intoxication disappear, physical vigor is restored and the mental status becomes normal. In the case histories cited below the close relation of intestinal stasis to mental disease is clearly indicated, and a relief of the abnormal mental condition, as a result of surgical correction of intestinal pathology, is plainly evidenced.

E. A. Eleven years of age; female. This patient came under the writer's care in June, 1916, at the suggestion of Dr. Graeme Hammond. The birth and early childhood were normal except for chronic constipation which was present even during babyhood, when it was necessary to give the child an enema almost daily. X-ray of the skull showed no abnormality. The family history is irrevelant.

September, 1915, at ten years of age, the patient had attacks of what was apparently petit mal—as many as twenty a day. She was placed in a hospital where she remained for four months taking a rest cure; on a fruit and vegetable diet for eleven weeks and later on a milk diet for five weeks. The attacks did not abate. Dr. Hammond barred out essential epilepsy, and sent the patient to me for relief of any possible abdominal condition.

On clinical examination, I found distinct tenderness over the head of the colon and appendix. The large colon was prolapsed, the cecum was distended and lay in the true pelvis. X-ray of the intestinal tract showed a delay in the passage of the food through the terminal ileum, the transverse colon and sigmoid.

Operation was performed June 23, 1916. The gall bladder was distended and attached to the first portion of the duodenum by a tight band which continued down over to the transverse colon near its hepatic flexure, which was prolapsed. A band about three inches broad ran from within an inch of the tip of the gall bladder to the gastro-hepatic omentum. There was a duodenal kink of marked degree. Just above the cecum the ascending colon was bound down tightly; the hepatic flexure was grown to the ascending colon

and the sigmoid was very redundant. There was an ileo-pelvic band, about three inches from the ileo-cecal valve, which was so placed mechanically that the cecum which had already begun to form a diverticulum caused a degree of ileal stasis which might easily account for the ileal delay. The bands were severed; kinks corrected; the diverticula were turned in, first being treated with iodine; the cecum was plicated, and the cecum and ascending colon were elevated, rotated outward and anchored to the postero-lateral shelf. The patient left the table in good condition.

Following the operation, the nerve condition rapidly improved. The seizures of petit-mal were reduced to a minimum and, except for a slight attack at long intervals, (and these usually follow a protracted excitement or fatigue) practically disappeared. The patient has remained in excellent physical condition—a member of the high school basketball team—and has made a brilliant record both at high schoool and during her first three years of college. She enjoys all the pursuits of the perfectly healthy girl and on examination, August, 1925, the writer found her normal in every respect. November 15, 1926, she reported that she was well and continuing college.

K. E. Female; 37 years of age; single. In March, 1916, the patient had an attack of amoebic dysentery in Korea. Her trouble seemed to date from that attack. In June, 1916, she began to have a great deal of abdominal soreness and in September, she discovered a rapidly growing mass in the abdomen. Within a few weeks, she lost twelve pounds in weight and at times had marked obstruction of the bowels. During these attacks it was necessary to use opiates for the severe pain.

After reaching the United States, some preliminary treatment to get her ready for operation was instituted; and operation was performed February 7, 1917. On opening the abdomen, a tumor of the right ovary, about the size of a six months' pregnancy was found. This was tightly adherent to the bladder, to the abdominal wall and to about three feet of intestine; and the right ureter was tightly adherent to this mass. Attached to the left side was also a cystic tumor, about the size of an orange, which was adherent to the rectum. It seemed to be near the site of one of the old ulcers which apparently resulted from the amoebic dysentery.

The tumor was removed; the raw surfaces were covered. The patient was returned to her room in a state of marked shock. She was in a state of severe depression for many weeks following the operation. A confusional state and hallucinations were present. It was necessary at times to restrain the patient. For 21 days it was necessary to feed her by tube through the nose.

* Preliminary report—Bainbridge, Wm. Seaman. The Constitutional Effect of Prolonged Intestinal Toxemia. (Medical Journal and Record, October 21, 1925.)

After many weeks of care, the mental condition cleared and, eventually, the patient became perfectly well mentally and physically.

This case was one of an infection-exhaustion psychosis which was the direct result of superimposing the operative shock upon a nervous system already unstabilized by years of absorption of toxins from the alimentary canal. The patient was evidently able to carry the toxic infection with a certain margin, but when the surgical shock was added, she collapsed mentally.

On April 15, 1927, patient was in good condition.

Dr. Henry A. Cotton, in a paper entitled, "The Relation of Focal Infection and Mental Disease," indicates the efficiency of removing the centers of infection as part of the routine treatment of all mental cases. He states that for the year 1918-1919 at the New Jersey State Hospital the following results were secured: "There were admitted 400 cases classified as the functional group, including manic-depressive insanity, toxic delirium, and dementia præcox. At the end of the year there were only 130 patients of this group remaining in the hospital—270 had been discharged.

At the end of a six months' period, 30 patients of this group had been discharged, and three months later only 60 of the original 400 were still in the hospital. A further examination of these 60 revealed the fact that a large proportion had definite intestinal lesions.

In all of the patients, examination was made for every possible source of toxic absorption; teeth; tonsils, mastoid; sinuses; genital and intestinal tracts, etc. Complement fixation tests of the blood, for the streptococcous group and the colon bacillus were done. The Wassermann test was given as a routine measure.

The reported results in these cases seem self-evident.

Dr. Kirby, of the Manhattan State Hospital, considers Dr. Cotton's generalization, that all mental disorders are due to bacterial toxemia, is far too sweeping. Dr. Kirby says: "Dr. Cotton's conception of a specific etiology, a bacterial toxin, ignores practically all of those elements which form the basis for modern biological conception of functional nervous and mental disorders. This generalization is certainly contrary to all that we have learned from the study of life histories, constitutional make-up, emotional factors and other conditions which stand in obvious relationship to the development of many behaviour disorders and mental conditions.

"That toxemia, infection and other physical conditions are often factors which precipitate a nervous and mental breakdown one will not deny; but there are many cases in which such factors cannot be shown to exist and still others in which, if infections are present, they are subsidiary to other causes as shown by the fact that their elimination does not result in restoration of the patient's health."

Here the conclusions of these two eminent psychiatrists are at variance. In the present writer's experience there is a middle ground in many of these mental cases. The problem of the *difficult diagnosis* must also be considered in assigning a mental case to a specific class. The difficulty of differentiating the conditions in their *early* states is often very great. While the writer makes no claim that a deterioration psychosis can be restored to a normal mental status, he believes that there are many mental conditions, which diagnosed and treated in their early stages, can be greatly relieved, or even cured by the elimination of primary, or contributory causes, particularly auto-intoxication.

One of the important contributions to the study of mental disease is that of J. G. Porter Philips, whose article on "The Early Treatment of Mental Disorder" appeared in the Lancet of 1923. As the title indicates, the article emphasizes the necessity of diagnosing a mental condition *before* deterioration takes place, that is, in the earliest possible stage, and establishing the treatment before radical measures are indicated. Dr. Phillips says, in part, "mental disorder in its earliest stage, as most psychologists understand it, is a condition of mind that more often than not may permit an individual to adjust himself to his surroundings and follow his avocation without ever reaching the stage when the medico-legal label of 'insanity' has to be applied to the case. The problem of the so-called shellshock patient has forced the whole question of the *early* treatment of neurosis and psychosis to a position of pre-eminence and recurring persistence. If the shock and violence of war experiences resulted in complete inability to face reality, and if by *care, understanding* and *skilled treatment,* mental and moral balance could be restored, there is no reason why civilians, harassed and bewildered by their social environment, *should not experience a like benefit from similar care and treatment.* Neuroses, psychoneuroses and psychoses all have common basic origins in both soldiers

and civilians, whether due to shock, lack of adaptation, or physical condition.

Without entering into an etiological discussion regarding mental disorders, there are certain facts which must be stressed to make clear our position regarding the relation between toxic centers of the human body and certain types of psychoses. First, granting that in many so-called insane patients there is a predisposition to insanity—a constitutional inferiority—it is, nevertheless, true that more often it is a *combination* of *causes* rather than a single factor which produces the final result in many psychopathic states. The added "straw" in the production of the psychosis may be simply a change of environment, possibly an added economic pressure, or one of the thousand other significant or insignificant elements which enter into the problem of daily living.

Borne without the stress of an auto-intoxication the normal, or even the potentially psychopathic individual, might meet the added economic or other burden, without a mental collapse. Weighed down, however, by the auto-toxic effects of an intestinal, a gall bladder, a thyroid or other condition he succumbs *mentally* to the added physical strain imposed. Thus the physical abnormality may prove either a contributory or an essential cause but which ever it may be, neither a normal nor a psychopathic type is improved by the presence of a physical disability. Since the mentally normal person of today may be the acutely insane patient of tomorrow, it is the imperative business of the psychiatrist and of the surgeon to work in cooperation, so that no single abnormality, either mental or physical, shall be overlooked.

The possible points of toxic absorption in the human body are numerous and any one of these may be the site at which a general toxicosis (with, possibly, a subsequent mental change) may originate. The genital lesion, or inflammation, the toxic goitre, the cryptic tonsils, the infected kidneys, sinuses, gall bladder, or the diverticulum of the intestinal canal may be the selective site at which a psychosis has its inception. At any one of these sites there may be absorbed just the added load of toxin necessary to turn a "borderline" mental condition into a full psychopathic or to cause a healthy mentality to fall below the standard requirements for the normal human being.

And if the *physical* background in relation to *mental* conditions is important, the mental background in relation to physical conditions is equally so.

How many times have we permitted a surgical case to become also a neuro-psychopathic case or even a full psychopathic before we have called the psychiastrist in consultation?

Allibutt says "there is no such thing as typhoid fever, angina-pectoris, as spleno-medullary leukaemia, etc., the things so called are (men) Wilkinson, Johnson and Thompson, who after their kind are afflicted not alike, but within such limits of similarity as to lead us to class them together and to form a general conception of them."

Herein we err:! An abnormal mental condition is not a morbid entity—an independently existing psychosis. It is a number of different conditions due to a variety of causes. Insanity is not a disease. It is rather a grouping for a large number of different diseases.

White says the aim of psychiatry is no longer considered to be either to find a diseased nerve cell or to make a hard and fast diagnosis of a given condition, at a given time. To understand psychiatry, we must understand the individual, we must study not only his origin and development but his adjustment to conditions. The provocative causes of mental disorder are legion and the type of mental pathology may change from time to time.

The foregoing material has stressed the importance of the part which surgery may play in mental pathology; of equal importance is the part which psychiatry may play in medicine and surgery. Twenty-five years ago, the writer's old professor and friend, Prof. M. Allan Starr, of the College of Physicians and Surgeons, New York, made the statement that the study of neurology took an enormous amount of time, but the subject of mental disease could be adequately taught in five lectures.

In the last 20 years, the value of psychiatry in its relation to general medicine has become better understood and during that time, as chief surgeon of the Manhattan State Hospital, the writer has had ample time opportunity to see how very closely medicine and psychiatry may react on each other.

The new medical center in New York, is including a huge building to house the New York State Psychiatric Institute and Hospital in

order that mental and physical diseases may be studied together in the same clinics. This is, of course, the ideal method. To know all that is to be known concerning a patient's needs is the only way to obtain a balanced diagnosis.

Dr. G. H. Kirby, in a recent personal communication to the writer, says "Happily the program of psychiatry during recent years has brought a broader conception of the nature of nervous and functional disorders and has evolved more effective methods of treatment.

"From the pathological standpoint, it is necessary to realize that we are dealing with complex human reactions which involve the total personality and which must have, necessarily, both a mental and physical aspect. These reactions are not due to specific causes nor are their manifestations explainable on the basis of a single factor.

"In a sensitized individual an emotional (mental) insult in certain biological mechanisms will cause a pronounced disturbance of circulation, digestion, etc., just as promptly as protein will cause a disturbance in other biological mechanisms of the individual.

"A morbid fear or delusion represents an effort on the part of the organism at defense against certain situations, cravings or ideas, just as definitely as does inflammation represent defensive efforts on the part of the organism against dangers of another sort.

"In unstable or emotionally sensitized persons, a functional nervous or mental disorder may be precipitated by various causes and usually both mental and physical factors are involved. Certain persons react quickly with delirium to an infectious disease; in other individuals physical disturbances such as sepsis, toxemia, fatigue, etc., will promptly release a neurotic condition. In many of these cases, it requires a most careful study to determine whether gastro-intestinal, cardio-vascular, or other symptoms are due to organic lesions, or whether they are not determined through emotional conflicts, repressed wishes, unsatisfied cravings, etc., in many instances the clinical picture is the result of a combination of both physical and psychic factors and it is only by considering both aspects, that successful treatment will be achieved in these functional and mental disturbances."

Obviously, there is a large field for cooperation between the psychiatrist and the surgeon. Dr. Kirby says that in practice outside

of institutions, it is unfortunately not the custom of internists or surgeons to give to the psychic factors the consideration they deserve. Many patients of psychic type are not admitted to State institutions because there is no question of their sanity—although they are really suffering from an underlying mental condition. They are encountered in great numbers in private practice as nervous or unstable personalities, hypochrondrical individuals, neurasthenics, psychoneurotics, psychopathic types, etc. They usually come to the physician with the underlying mental trouble disguised by many physical symptoms—especially of cardio-vascular, gastro-intestinal and genito-urinary origin.

The first step is the elimination of the local condition, but the surgeon must realize that unless he also recognizes the psychic aspect of the case, that pelvic repairs, removal of infections, displacements corrected, etc., often will not fully clear up the symptoms. There is still the hypersensitive, unstable, maladjusted personality to deal with and a psychological approach, with psychotherapeutic measures are important features of the treatment.

In closing may I paraphase a favorite remark of Prof. William James? "There is very little difference between sanity and insanity, but what little there is, is *quite* important! ! And, sometimes, the difference between these states which we term 'sanity' and 'insanity' is based on nothing more essentially psychopathic than surgical repair or the removal of pelvic or intestinal lesions—the elimination of toxic and fatigue factors—and rational adjustment.

MALARIAL INOCULATION IN CASES OF DEMENTIA PRAECOX

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On July 17, 1925, we received at the Marcy Division on transfer from Manhattan State Hospital, two male patients previously inoculated with malaria, to be used as a nucleus in the institution of malarial treatment for cases of general paralysis. A thorough physical examination in the case of one man revealed no neurological defects and subsequent serological findings proved negative for syphilis. We, therefore, had in this man a pure strain of malaria which it seemed advisable to retain for use in the treatment of cases of post-encephalitis lethargica, multiple sclerosis and other affections of the central nervous system.

To do this it was necessary to inoculate from time to time a man not so afflicted, in order that the strain might be tided over from one case to the next one not immediately available, and a young healthy schizophrenic was selected at such times. After several schizophrenics had been inoculated in this manner, some improvement in one respect or another was observed in the condition of some, and it was decided to continue malarial inoculation, temporarily at least, as a mode of treatment for this type of mental disease.

Between July 22, 1925 and September 21, 1926, 36 such patients were inoculated with malaria, and the time that has now (June 1, 1928) elapsed since these men completed treatment ranges approximately from 2 years 10 months to 1 year 8 months. The results obtained have not been sufficiently encouraging to warrant a continuation of this mode of treatment. Indeed, judging from present observations, results have been almost negative, and because of this an earlier report of the treatment of these cases was not made. Believing, however, that the report of negative results is of some small value in influencing the course of future therapy, I beg to submit the following brief outline of work done and some subsequent observations.

A similar investigation made by Dr. L. E. Hinsie[1] at the Psychiatric Institute, New York, has been reported. Thirteen female

1. Hinsie, L. E. Malarial Treatment of Schizophrenia. THE PSYCHIATRIC QUARTERLY, Vol. 1, No. 2, April, 1927.

patients, cases of dementia præcox, all of the hebephrenic type, between the ages 17 and 42, were given treatment. "During the period of malarial fever and of convalescence, several of the patients exhibited interests that had not previously been seen in the psychoses. However, not one of the cases of schizophrenia, 6 months after the termination of treatment, showed any improvement in her general clinical picture." Ten were unimproved, 1 was worse and 2 died during treatment; 9 of the unimproved, however, showed gains in weight of 2 to 59 pounds, whereas the one who was worse had lost 9 pounds.

The work at Marcy was carried out on a male service and the 36 patients in this group were almost all quite markedly deteriorated. Twenty-five were foreign-born with very little grasp of the English tongue and the remaining 11 born in America were mostly sons of immigrants from non-English speaking nations. No selection was made, except as regards age and general health, the younger and more vigorous being inoculated first, in order to reduce to a minimum any attending risk, their ages ranging from 24 to 50, 8 being under 30 years and 10 over 40 years of age. These patients were representative of all types of dementia præcox, having been divided diagnostically as follows: hebephrenic 15, paranoid 14, catatonic 1, simple 3, unclassified 3; but deterioration had left in very few cases the characteristics which had formerly thus separated them.

The duration of the psychosis in these cases prior to malarial treatment, where an authentic history was available, ranged from 1 year 6 months to 25 years. Three men had been ill over 20 years, 10 men over 10 years, at least 9 over 5 years, and the remaining 14, as far as could be ascertained, something under 4 years. Approximately one-half of these men were unable to apply themselves at any simple occupation, many of them wet and soiled, requiring constant care and attention, and all, without exception, displayed deterioration in the interest and emotional fields.

As regards the treatment itself, following inoculation, these patients were allowed to have from 5 to 15 malarial paroxysms, attaining temperatures ranging from 104.6 degrees to 107 degrees, and aggregating from 21 to 112 hours of fever over 102 degrees, before quinine was administered to terminate the malaria.

Now, as regards the results of this treatment, no patient, except

one who died of acute myocarditis 2 days after cessation of malarial treatment, can be said to have suffered any permanent mental or physical harm or to be worse at the present time than he was before treatment. In 22 of the 35, however, no appreciable response to the treatment could be observed and they remained listed as permanently unimproved. The remaining 13 patients showed varying degrees of improvement over their previous condition, evident in 7 cases immediately following treatment and in the remainder within two to three weeks. In 4 cases an improvement over their condition prior to treatment was still evident, though not so marked, after a lapse of 6 months, but the other 9 patients had slumped to their previous mental and economic level within from 2 to 5 months. Only 1 man at the present time, 26 months after completing treatment, can be described as still maintaining a definitely improved condition.

It might be mentioned here that during treatment these men lost in weight from 0 to 21 pounds, an average of 8⅓ pounds, subsequently regaining from 1 to 69 pounds, an average of 15½ pounds per patient. They at present show a gain in weight over that prior to treatment of from 6 to 59 pounds or an average net gain in weight of approximately 11 pounds, all but four having shown a definite improvement in that respect.

Those subsequently listed as temporarily improved lost an average of 8½ pounds during treatment, and the unimproved lost an an average of 8¼ pounds. The three who failed to regain their original weight subsequent to treatment all showed temporary mental improvement. The improved group have gained an average of 5½ pounds, while the unimproved gained an average of 13⅓ pounds over what they had weighed before treatment. The improved group, at the height of improvement, weighed an average of 2 pounds more than they had originally weighed, and, as is evidenced by above figures, have gained an average of 3½ pounds more since they began to again regress. There was apparently no correlation between physical and mental improvement.

As pointed out by Hinsie: "The addition in weight compares favorably with that observed in cases of general paralysis treated with malaria, especially with those who show signs of improvement in the mental sphere."

The matter of age was apparently no factor here, the average age of the improved being 35 and that of the unimproved 36 years.

The average duration of the psychosis before treatment in the two groups was found to be the reverse of what one might expect, the improved having been ill an average of 10 years and the unimproved an average of 8½ years.

The improved group had had an average of 9.7 paroxysms covering an average total of 67 hours above 102 degrees, whereas the unimproved group had had an average of 8.4 paroxysms covering an average total of 62½ hours above 102 degrees, an observation of possibly only slight significance.

Those patients suffering from the paranoid type of dementia præcox were apparently most favorably influenced, 8 cases out of 14 having shown some temporary amelioration of symptoms, while 4 out of 15 of the hebephrenic type and 1 out of 3 unclassified made up the balance of those who showed improvement.

Improvement in the mental condition of these patients revealed itself in various ways. Those who formerly wet and soiled themselves became cleanly in habits and more tidy in general appearance. Mischievous and destructive patients became much better behaved and in some cases were taught to put their energy to constructive use. Others, formerly dull of comprehension and apathetic toward their environment, became more alert and began to display a personal interest in things and incidents about the ward. The unsociable and seclusive showed an inclination to mingle and converse. Some who were formerly talkative, excitable or noisy in reaction to hallucinations or otherwise absorbed in phantasy were brought into renewed contact with reality, becoming more quiet and amenable and more interested in their surroundings. Others again who had not employed themselves in any respect for several years, in some cases even to care for themselves, were now able to assist at various light tasks about the ward. To sum up, a patient was considered to have shown improvement, who, having previously been a decided care, liability and economic drawback, now became, temporarily at least, a relative asset to the ward, in that he was not only able to care for himself in most respects but also employed himself under supervision at some useful occupation.

This improvement, however, as above noted, was but fleeting and

very few months had elapsed in most cases before he was slowly but unquestionably regressing toward his previous mental state. Some credit for sustaining this condition for so many weeks must, we feel, be given to the fact that, as soon after the completion of treatment as possible, each patient was sent to the occupational therapy center and there assigned some occupation graded to meet his ability and an endeavor made to hold and develop his interest. It was hoped that part of the libido which had apparently been detached from its fixation on the ego or on phantasy might be induced to extend itself toward some useful and economic end and thus lead the patient back to an increased interest in reality, but the influence of much earlier and more lasting fixations was evidently too strong to offset.

Although almost all of these patients might be said to show a fairly marked degree of regression, for purposes of comparison, the group has been arbitrarily classified, according to the depth to which each had regressed, as deep, moderate and slight regression.

Those who were markedly demented and inaccessible, destructive to their clothing and filthy in personal habits have been classified as deeply regressed.

Those who were more accessible and cleanly in habits, but unsociable, seclusive, disinterested, careless of their appearance and unable to apply themselves at any occupation are regarded as moderately regressed.

Those who showed and expressed an interest in their environment and things outside of the immediate hospital life and some desire to support and regulate themselves, along with an inclination and ability to occupy themselves to some purpose are said to have shown slight regression.

On this basis, 14 were deeply regressed, 16 moderately regressed and 5 slightly regressed. Of the 14 most deteriorated patients 5 were influenced favorably, of the 16 moderately regressed 4 improved and of the 5 least deeply regressed 4 responded somewhat to malarial therapy.

(See accompanying table, page 499.)

Cases of Dementia Praecox Treated with Malaria

Case No.	Age	Type of psychosis	Duration of psychosis, years	Degree of regression	Number of paroxysms	Hours of fever above 102°	Weight in pounds			When improvement began	Duration of improvement	End result
							Before treatment	At height of improvement	At present time			
* 1	50	Par.	25	Deep	13	84	103	114½	115	0 weeks	4 months	Unimp.
* 2	31	Heb.	8½	Deep	13	112	113	113	107	0 weeks	3 months	Unimp.
* 3	32	Par.	6½	Slight	15	75	135	144	143	3 weeks	5 months	Unimp.
4	49	Par.	8½	Mod.	9	38	101	...	104	.....	.....	Unimp.
5	25	Heb.	1	Mod.	10	75	120	...	135	.....	.....	Unimp.
* 6	26	Par.	2	Slight	8	23	119	131	134	3 weeks	7 months	Unimp.
* 7	24	Heb.	3	Deep	8	62	132	128	128	0 weeks	2 months	Unimp.
8	29	Cat.	11½	Deep	9	58	124	...	126	.....	.....	Unimp.
* 9	37	Par.	16½	Mod.	8	36	109	101	105	2 weeks	6 months	Unimp.
10	34	X	18	Deep	9	82	125	...	144	.....	.....	Unimp.
11	31	Simp.	5	Mod.	9	97	140	...	160	.....	.....	Unimp.
12	25	Heb.	4	Mod.	11	72	130	...	132½	.....	.....	Unimp.
*13	39	Par.	4	Slight	7	73	136	136	146	2 weeks	6 months	Unimp.
14	34	Heb.	4	Mod.	10	85	150	...	209	.....	.....	Unimp.
15	30	Heb.	13½	Deep	11	87	135	...	185	.....	.....	Unimp.
16	42	Par.	5	Mod.	10	89	140	...	146	.....	.....	Unimp.
*17	33	Par.	3	Deep	10	62	128	134	135	2 weeks	3 months	Unimp.
*18	26	Heb.	1½	Mod.	10	81	141	131½	144	0 weeks	26 months	Sl. Imp.

Cases indicated by an asterisk showed temporary improvement.

CASES OF DEMENTIA PRAECOX TREATED WITH MALARIA—(*Continued*)

Case No.	Age	Type of psychosis	Duration of psychosis, years	Degree of regression	Number of paroxysms	Hours of fever above 102°	Weight in pounds			When improvement began	Duration of improvement	End result
							Before treatment	At height of improvement	At present time			
*19	33	X	17	Slight	5	37	130	123	136	0 weeks	3 months	Unimp.
20	36	Par.	2	Mod.	6	50	177	...	179	.....	.....	Unimp.
21	42	Par.	3	Mod.	6	43	120	...	134	.....	.....	Unimp.
22	32	Heb.	8	Mod.	5	21	155	...	151	.....	.....	Unimp.
*23	41	Par.	1½	Mod.	5	21	156	128	119	0 weeks	2 months	Unimp
24	37	Heb.	9½	Deep	6	42	126½	...	143	.....	.....	Unimp.
25	31	Heb.	9½	Deep	9	82	129	...	139	.....	.....	Unimp.
26	40	Par.	12	Mod.	9	52	124	...	130	.....	.....	Unimp.
*27	47	Heb.	26	Deep	9	91	121½	118	132	0 weeks	2 months	Unimp.
28	39	X	17	Deep	9	64	101½	...	112	.....	.....	Unimp.
*29	41	Par.	17½	Mod.	10	76	105½	116	116	2 weeks	2 months	Unimp.
30	44	Heb.	3	Mod.	9	46	135	...	156	.....	.....	Unimp.
31	41	Heb.	3	Mod.	11	85	144½	.....	148	.....	.....	Unimp.
32	45	Par.	23	Deep	7	45	147½	...	164	.....	.....	Unimp.
33	36	Simp.	13½	Deep	5	30	123	...	123	.....	.....	Unimp.
34	39	Simp.	3½	Slight	8	95	123	...	148	.....	.....	Unimp.
35	28	Heb.	7½	Deep	10	77	115½	Died shortly after treatment				
36	33	Heb.	9	Deep	6	41	120½	...	125	.....	.....	Unimp.

Cases indicated by an asterisk showed temporary improvement.

The following few brief case summaries illustrate the way in which malarial inoculation affected some of the patients thus treated:

CASE 2. (J. D.): This man, aged 31, had been in hospital for over 7½ years with a psychosis of 8½ years' duration. Prior to treatment he was dull, seclusive, idle and indifferent, extremely careless and untidy about his clothing and filthy in personal habits. Was at times impulsive, biting the furniture and electric push buttons or pushing his hand through a window pane. He mumbled inaudibly to himself but when interviewed responded with only a silly grin. Much time and perseverance had been expended by the occupational therapy department in endeavoring to awaken some interest but he remained unable to apply himself at any simple task. He weighed 113 pounds. Diagnosis: Dementia præcox, hebephrenic type.

He was inoculated August 22, 1925, following which he was allowed to have 13 paroxysms with a total of 112 hours of fever above 102 degrees, the highest temperature attained being 106 degrees. Meanwhile he lost 3 pounds in weight. Following treatment some evidence of improvement was observed. Then he is noted as being quiet and orderly, still unsociable and disinterested but apparently in better contact, cleanly in personal habits and somewhat neater in appearance. He occasionally smiled but did not talk to himself as formerly and when interviewed responded relevently with "yes", "no", and "I don't know". He committed no more impulsive and destructive acts, was fairly compliant and assisted in polishing floors. He now employed himself in the occupational therapy center, albeit at very simple tasks, and for some time caused very little trouble. He again weighed 113 pounds.

This improvement reached its peak within a month and was sustained for several weeks longer when he then began to slump to his former low level. He continued cleanly in personal habits but again became very careless of his appearance, disinterested, seclusive, inaccessible, non-compliant, irritable and impulsive. He has remained in this deteriorated condition and sits idly on the ward, at times whispering to himself, smiling and grimacing, and repeated attempts to arouse some interest in reality have been of no avail. He continues in good general health, although his weight during the past year or more has been in the neighborhood of 107 pounds.

CASE 7. (M. M.): Age 24. Had been in hospital two and one-half years with a psychosis of at least three years' duration. At time of treatment, he had been unsociable, restless, discontented, and had frequently attempted to escape from the ward. He was also irritable, impulsive and committed frequent unprovoked assaults upon other patients. He was untidy in personal habits and destructive to his clothing, requiring much supervision and resist-

ing attention. Was also very greedy and messy at the table. He could not be induced to apply himself in any way but wandered aimlessly about the ward, usually muttering, grimacing and laughing in a silly manner and making grotesque and purposeless motions, and at times becoming for a brief period excited and noisy, screaming and banging his head against the wall, probably hallucinating. He was inaccessible and appeared very stupid, simple grinning or making some inarticulate sound in response to simple questions or directions. The occupational therapy department had endeavored without success to get him occupied in some way. Diagnosis: Dementia præcox, hebephrenic type.

He was inoculated with malaria November 24, 1925, and allowed to have 8 paroxysms with 62 hours of fever above 102 degrees, the highest temperature attained being 106.2 degrees. His weight fell from 132 pounds to 115 pounds. During treatment he continued restless and noisy, particularly at night, but he was cleanly in personal habits, and immediately following treatment a change in his attitude and conduct was observed. Although still unsociable, he had become relatively quiet, composed and compliant, kept himself somewhat neater and assisted in polishing floors. He was able to understand directions given and when interviewed appeared more intelligent, giving brief relevant answers to some questions and to others responding in a foreign tongue. In the occupational therapy center, although employed only at simple tasks, he was spoken of as a willing and fairly steady worker.

This improvement lasted approximately two months and would probably have been sustained longer had he not accidentally injured a finger in the occupational therapy center and been returned to the ward for a time. During this temporary enforced idleness, he quickly lost interest in his environment, became more untidy and again absorbed in phantasy. He talked and laughed to himself, making various odd motions, was again very restless and impulsive, and periods during which he was excited and noisy became more and more frequent. He would later do no work on the ward and when returned to the occupational therapy center could not be induced to occupy himself in any way. He had slumped to his previous low regression and has since shown no amelioration of symptoms. His physical condition is good, however, and he weights at present 128 pounds.

Case No. 13. (T. D.): This man aged 39, had been in hospital three and one-half years with a psychosis of 4 years' duration. Prior to malarial treatment, he was fairly quiet and orderly if left undisturbed and, although somewhat untidy in appearance, was cleanly in personal habits. He was, however, unsociable, sullen, irritable and antagonistic, grumbled a good deal to himself and resented being interviewed or asked to do anything.

Would employ himself only under constant supervision and was at times extremely stubborn and resistive. He had a poor grasp of English but when most cooperative gave expression to persecutory ideas, e. g., his money had been stolen, someone had tried to poison him, he was being detained illegally and wanted to go home to Hungary. He was physically well and weighed 136 pounds. He had been diagnosed "dementia præcox, paranoid type."

He was inoculated with malaria January 28, 1926, and subsequently had 7 paroxysms with 73 hours of fever above 102 degrees, the highest temperature attained being 105.6 degrees. He lost 7 pounds under treatment. No appreciable change in his condition was at first observed but within three weeks some improvement was noted. He was still rather morose and unsociable but ceased complaining and became quite approachable, responding to questions in a relevant manner with some spontaneity. He begged for his release and return to Hungary, claiming that he had $1,784 in the savings bank and was able to support himself but his delusional trend had lapsed into the background. He kept himself neat and cleanly, was compliant on the ward and described as a steady and efficient worker, with an outside party. He appeared in much better contact with reality.

He continued in this fairly comfortable state for many weeks before it was noticed that he was insidiously slipping, but at the end of six months it could not be said that he was any longer better than before treatment. He had gradually become more unsociable, irritable and discontented, again grumbling to himself about his ill-treatment, resenting any person's approach and employing himself disinterestedly and only under pressure. He was evasive and sarcastic when interviewed, cooperating very poorly but at times expressing his former persecutory ideas. He took less interest in his appearance and surroundings and had ceased to be an asset either on or off the ward. He has continued as above noted up to the present but is still in good health, now weighing 142 pounds.

Case No. 29. (S. R.): Age 41. Had been in hospital 14 years with a psychosis of 17½ years' duration. Before treatment he was dull, stupid and inaccessible, cleanly in personal habits but untidy in appearance and so greedy and careless at the table that it was necessary to feed him by himself. He was unsociable and seclusive, sitting idly by himself or wandering aimlessly about and at times impulsively and unprovocatively struck some other patient near him. He was on the whole quite apathetic and apparently not actively hallucinated. An endeavor was made to employ him in the occupational therapy center but no interest could be aroused and he was unable to occupy himself in any way. He had been in this condition for several years and had previously been diagnosed "dementia præcox, paranoid type."

He was inoculated with malaria July 10, 1926, following which he suffered

10 paroxysms totaling 76 hours of fever above 102° the highest temperature attained being 106 degrees. His weight dropped from 105½ to 98½ pounds. During treatment no appreciable change was observed; he mumbled to himself at times but remained practically inaccessible and kept his bed in a very untidy condition. No definite improvement was in evidence until two weeks later when he began to appear somewhat brighter and more alert than formerly, displayed some interest in what was going on about him and when spoken to responded in a brief, relevant fashion. He was sent to the occupational therapy center for further treatment and is later noted as a willing and steady worker, although able to accomplish only rather simple tasks. He was quiet, orderly and compliant on the ward and now assisted in polishing floors. He ate and slept well and weighed 116 pounds.

He remained in this partially improved condition approximately two months, when, for no apparent reason, there was a rapid falling off in interest and attention, he made no progress in his work in the occupational therapy center and became idle on the ward, pushing a floor polisher listlessly only while constantly urged. He again became very untidy about his person and at table and never spoke even when addressed. He is at present physically well and weighs 117 pounds, but has since shown no indication of again improving, remaining dull, seclusive, disinterested, untidy, inaccessible and in every way deteriorated.

One patient in this series, because of the length of time his improvement has been sustained, is worthy of special note.

Case No. 18. (A. R.): Aged 27, born in Russia, 1899, came to the United States in 1912, no history of family, education or make-up, able to read and write, untrained laborer, single. Admitted to Manhattan State Hospital September 28, 1924, after having jumped into North River. Appeared depressed and said he had been sick for over two months, his stomach and his head were not good and he could not sleep; God had told him to jump into the river and he would be a better man. He was unsociable, seclusive, disinterested, untidy and destructive to his clothing, uncooperative and resistive. Transferred to Marcy, January 9, 1925. Diagnosis: "Dementia præcox, hebephrenic type."

Prior to inoculation with malaria on March 20, 1926, patient was still unsociable, seclusive, suspicious, irritable, sullen, antagonistic and resistive, talked to himself a good deal and was believed to hallucinate, at times being noisy, profane, abusive and threatening. He would not cooperate in any way, being impudent, and sarcastic and, although sent to the occupational therapy center for training, remained idle and disinterested. He was allowed to have 10 malarial paroxysms with 81 hours of fever over 102 degrees, the highest temperature attained being 105.4 degrees. His weight dropped from 141 to 128 pounds.

Two weeks after treatment he was observed to be quieter and more submissive, pushing a floor polisher when requested and giving brief, relevant answers to questions, but he still appeared rather glum and exhibited an underlying irritability. Within three months after treatment he displayed a marked improvement, being at all times quiet, orderly and agreeable, more sociable and congenial and in better contact with his environment. His affect appeared much more natural and adequate, he displayed no irritability and was much more contented, occasionally looking at magazines, playing pool, etc. He cared for himself in all respects, being neat and cleanly, and he was rendering interested and efficient service in the occupational center where he had been employed for some time, showing an ability to adapt himself to a variety of tasks. Owing to his very poor grasp of English, however, it was difficult to get into very close touch with him. Three months later no essential change was noted in his condition and he was still getting along very comfortably.

Nine months after treatment a slight falling off in interest was noted, he did not display his accustomed enthusiasm or initiative, he was less sociable, and was at times observed muttering to himself. He was still a willing and efficient worker, however, quiet and orderly on the ward, and cared for himself in every way. He still shows a slight improvement over his condition prior to treatment over 26 months ago. He is less friendly and open when approached keeps to himself and at times appears somewhat sullen and suspicious, but he is still quiet and compliant, keeps himself neat and cleanly, causes no trouble whatsoever and is still rendering good service in the pre-industrial center and out of doors. His physical condition is very good and he now weighs 144 pounds, 3 pounds over his original weight.

ILLUMINATING GAS POISONING

*An Experimental Study of the Lesions of the Nervous System in Acute and Chronic Stages**

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For more than sixty years the attention of investigators has been directed to the study of the pathology of the central nervous system, resulting from carbon monoxide and illuminating gas poisoning. Various lesions and various explanations for their causation have been reported but, unfortunately, the data have been complicated at times by overlapping pictures of intercurrent pathology, or have been incomplete because of the nature and the duration of the poisoning and the focusing of attention on localized lesions to the exclusion of more generalized ones. Because of these facts, and because of the varying duration of the pathological process, we have thought it advisable to attempt a chronological study of the pathology of the nervous system in laboratory animals exposed to the action of illuminating gas.

The problem has seemed to us a very important one after considering the number of accidental or voluntary deaths due to illuminating gas poisoning and of the cases which, following the gassing, develop peculiar types of psychosis, thus requiring the commitment of the patient to the State institutions. On the other hand, the great analogy between the action of the illuminating gas and the carbon monoxide which produces various neurological conditions (Braun,[1] DeCrinis,[2] Janossy,[3] Rosenblath,[4] Wimmer,[5] Merguet,[6] Kant,[7] Winkelman,[8] McConnel and Spiller,[9] etc.) has stimulated the more our desire of investigation. It must also be remembered that with the constantly increasing development of the automobile industry people in increasing number are exposed to the noxious action of the carbon monoxide. In a very recent paper McNally[10] has reported that in Cook County alone (Chicago) from 1919 to 1926, 63 cases of death due to carbon monoxide occurred following gas production from the exhaust of running motors. It may be said,

* We wish to express our thanks to Dr. Louis Casamajor and Dr. Frank Pike of the College of Physicians and Surgeons, for the use of laboratory facilities in the experimental work and to Miss Schreiber and Miss Mara of our laboratory for their valuable help in the technical work.

incidentally, that Krannenburg investigated 157 public garages and found 0.10 per cent carbon monoxide in the air 10 feet from the exhaust of a running motor and that in garages in which the air was contaminated to the extent of 0.2 per cent almost all the workers complained of headache.

Reports on the experimental pathology of illuminating gas poisoning are very few in comparison with the large number of papers dealing with human pathology. As recently as 1920, Lewin in his monograph on carbon monoxide poisoning could state that gross lesions were not detected in gassed animals, this constrasted, however, with Geppert's views that carbon monoxide has a specific action over the central nervous system and the results of Wacholtz's experiments that in gassed animals thrombi occurred leading to the formation of multiple areas of softening in the central nervous system. Following Lewin's monograph, Photakis reported in 1921 the result of experimental work in animals submitted to the influence of illuminating gas for various periods of time. This author was able to detect in the acute stages pathological changes consisting of hyperemia of all the blood vessels of the brain and small hemorrhages, symmetrically located in the basal ganglia. In the chronic stages, besides vascular lesions and minute hemorrhages, areas of softening were noticeable in the same locations.

The most recent paper on the experimental pathology is the one by A. Meyer[12] (1928) in which the author reports the result of his investigations in cats submitted to the action of the gas. Meyer found that the globus pallidus is the seat of election for areas of softening while in the cortex here and there areas of demyelination are found. The Ammon's horn, which is another seat of election in human pathology, has been found to be free from involvement with the exception of one case out of nine. No lesions were reported in the cerebellum or in the spinal cord.

Much more work has been done in human pathology and the majority of the investigators are in agreement, reporting hyperemia of the brain and meninges in acute poisoning. Not only the veins but the arteries and the smallest capillaries are dilated (Weimann[13]). Diapedesis is a usual sight while true hemorrhages either in the brain or in the meninges have been rarely observed, although mention of their occurrence is found in the works of Hed-

ven, Hill, Semerak, Hiller,[14] etc. Hill and Semerak have also reported the presence of hemorrhage in the centrum ovale, pons and medulla oblongata. Besides a generalized hyperemia, pallor of the cortex in general or of particular areas (lenticular nucleus, Ammon's horn) has been reported (Zieler,[15] Hiller, Weimann).

Particular attention has been paid to the vascular pathology and as far back as 1868 Simon reported on fatty degeneration of the blood vessels. Mention of proliferative and degenerative changes are also found in the work of Becker[16] (1887) and Sibelius[17] (1903). The presence of thrombi has been a very common finding according to the investigations of Scheiding,[18] Heinicke, Lanceraux, Kolisko,[19] Wachholtz,[20] Ruge.[21] New blood vessel formation has been reported by Stewart,[22] Hiller, Wilson and Winkelman[23] and endothelial proliferation and fatty degeneration by Mott. Thrombosis of the veins has also been a common finding. The vascular lesions may affect the different areas of the brain but it has been reported as occurring more frequently in the basal ganglia (Polchen,[24] Simon,[25] Becker, Sachs,[26] Mott,[27] etc.).

Since the early investigations authors have been impressed by the frequent changes in the basal ganglia where even areas of softening were found. These softenings are usually bilateral and symmetrical and seem to involve in a special way the internal portion of the globus pallidus. Such an electivity of the softening for this region is found in the reports of Kolisko, Stolper,[28] Wilson,[29] Huguenin, Sibelius, Hiller, Ruge, Stewart, Meyer,[30] Richter,[31] Grinker,[32] Photakis,[33] Weimann and many others. The striatum is not, however, the only seat where softenings have been detected as Stolper reports some involvement of the optic thalamus and other authors mention the presence of softening in the hypothalamus, the substantia nigra and occasionally in the internal capsule (Hiller, Hill, Semerak, etc.). The pathology of these areas of softening does not differ from the usual type in regard to the degenerative and reactive changes (neuroglia reaction, nerve cell degeneration and presence of scavenger cells. Besides the areas of softening, lesions have been reported which involve the nerve cells of the basal ganglia, ranging from moderate pyknosis to extreme fatty degeneration and destruction (Hiller, Stewart, Hill, Semerak, Winkelman, Wilson, etc.). The glia activity in the involved areas manifests both progressive and regressive changes.

An involvement of the cortex has also been reported, the changes occurring in the nerve cells, neuroglia cells and the blood vessels. In the brain stem, small areas of softening as well as punctiform hemorrhages have been reported and Hiller mentions occurrence of softening in the nuclei of Goll and Burdack. Involvement of the myelin sheaths in the mesencephalon, pons and medulla is reported by Stewart. The olives have been found the seat of neuroglia reaction, and areas of softening have been reported as occurring in the cerebellum. Degenerative changes of the Purkinje cells and of the cells of the dentate nuclei are mentioned here and there in the literature.

In the spinal cord changes have been found in both the white and th gray matter. Congestion, diapedesis, small hemorrhages and areas of softening have been described. Degenerative changes of the ganglion cells have been reported among others by Bokitansky[34] and Sibelius. At the lower cervical and higher dorsal levels the cells of the anterior horn have been reported grouped into heavily stained and markedly altered masses.

Since the investigation of von Monakow and Kitabaiashi,[35] Stern and Gautier,[36] etc., attention of the workers has been directed more and more to the choroid plexi, ependyma and sub-ependymal tissue which constitute the main portion of the so-called ectomesodermic barrier. Allende Navarro[37] has investigated the pathology of these special structures in two cases of carbon monoxide poisoning and found that the glandular elements of the choroid plexus of the third and fourth ventricles disclosed changes ranging from nearly normal cells to entirely atrophic elements. The lesion of the cells consist of vacuolization, and subsequent degeneration. The ependymal cells were swollen and here and there entirely atrophic so that the ependymal palissade was altogether absent. A reaction of the subependymal glia was quite definite. The blood vessels were dilated at the periphery of the involved areas while thrombi were seen in the center of the degenerative mass. Lesions of the choroid plexus involving mainly the epithelial cells have also been reported by Cobb, Forbes and Fremont-Smith in their experimental work on carbon monoxide. In their cases the lesions were described as swelling of the epithelium, irregularity of outline and loss of nuclei.

To explain the pathology of gas poisoning and especially of the

occurrence of symmetrical softening, various theories have been advanced by the different investigators. The occurrence of symmetrical softenings in the striatum and especially in the internal portion of the globus pallidus, a fact which has been substantiated by very numerous reports, is explained on the basis of a particular anatomical distribution of the blood vessels of this region. We are indebted to Kolisko (1893) for the first investigation of this subject and since the time of his first work the majority of authors have agreed with his explanation. Kolisko thought that the facility for the occurrence of vascular lesions in the globus pallidus (thrombosis) was due to an anatomical condition, i. e., the sharp angle at which the branches of the middle cerebral artery separate from the main trunk when they enter the lenticular nucleus and to the sharp recurrent course which these branches follow in the ganglion. The resulting sharp angle establishes a point of marked pressure of the blood stream against the vessel walls thus rendering quite easy the occurrence of thrombi and consequent areas of softening. The findings of Kolisko have been for the most part entirely confirmed by Goldstein's[38] investigations.

As the Ammon's horn has been found to be the seat of election of degenerative lesions an attempt has recently been made by Uchimura[39] to investigate the blood supply of this region. This author has reached the conclusion that the blood supply of the Ammon's horn is not the same all over the structure and that some of the sectors (Sommer's sector) have a greater vulnerability in connection with the anatomical distribution of the blood vessels and that altogether, the general sensitivity of the Ammon's horn is related to an incomplete and imperfect capillary supply.

Independently from the anatomical predisposition of given areas the mechanism of formation of pathological lesions resulting from gas poisoning has formed the subject of more than mere speculation. The field has been mainly divided among those who believe the process to be the expression of a primary encephalitis directly caused by the carbon monoxide to the nervous tissue, those who believe in the occurrence of true anatomical vascular changes, and those who feel that functional vascular changes only occur leading secondarily to ischemia and softening. A review of these different opinions is carefully reported in Dr. Ruge's paper which may be useful briefly to summarize here.

Among the very first, Klebs[40] (1865) expresses the view that softenings are due to vasodilatation of the blood vessels the result of which is a modified blood supply and oxygen deficiency. The overexpansion of the blood vessels, because of the accompanying increased pressure may involve the surrounding nervous tissue.

Simon (1868) thinks that the lesion of the nervous systems are secondary to degenerative changes of the blood vessel.

Huguenin (1880) admits that the softenings are a result of vascular changes but not of the inflammatory type.

Poelchen first felt (1882) that the lesions were the result of a primary action of CO-hemoglobin on the intima and adventitia of the blood vessels resulting in fatty degeneration and breaking of the blood vessel walls, while in a subsequent paper (1886) he left the question open as to the location of the primary lesions whether it be in the nervous parenchyma itself or in the blood vessel wall.

Changes in the blood vessel walls are denied by Lesser[41] (1886) who believes that the softenings are the result of acute hemorrhagic encephalitis.

Scheidung and Heinecke (1888) express the viewpoint that chemical changes may occur in the red blood cells, thus leading to a nutritional modification the result of which may also be the formation of multiple thrombi.

Becker (1889) describes the fatty degeneration of the blood vessel as the cause of the softening while Lanceraux, the year after, (1890) claims that the occlusion of the blood vessel is rather a mechanical occurrence due to the extravasation of the red blood cells in the thickness of the adventitia. Kock's views in 1892 are again in favor of the primary involvement of the blood vessel walls.

Geppert[42] (1892) claims the specific action of CO over the central nervous system.

We have already mentioned the point of view of Kolisko (1893) according to whom, anatomical reasons are at the basis of the predilection of the softening for the basal ganglia. This author believes however, that besides this morphological factor the vasodilatation which he reports occurring in cases of gas poisoning may act mechanically on the surrounding tissue, thus upholding the view expressed a long time before by Klebs.

tative encephalitis. He claims that following necrobiosis of the nerve tissue and the production of a massive quantity of gitter cells, a stimulus is created to activate the inflammatory component of the process (interstitial reaction and perivascular infiltration). These inflammatory changes do not necessarily belong to the pathology of the poisoning which differs also from the common type of encephalo-malacia on account of the lack of true occlusion of the blood vessels. The thrombi reported by other investigators may be explained by their formation in agonal periods while the blood circulation slows down. It must be said, however, that investigations of Subenhaar and Lehman have shown that in carbon monoxide poisoning there is a tendency for thrombi formation due to the increased power of coagulation of the blood.

Sachs (1900) was among the first to express the view that in the light form of carbon monoxide poisoning not true anatomical but simply functional changes occur in the vascular system.

Again in 1902, the view is expressed by Runeberg and Kobert that carbon monoxide has a specific action on the nervous tissue, thus considering the vascular lesions as secondary ones. On the other hand, Sibelius thinks that CO may act primarily over the nervous tissue and over the vascular system where proliferative and degenerative changes take place.

Wackholtz expresses the view that the formation of thrombi which are the cause of the softening, are the result of the vasodilatation which occurs under the action of the gas.

Chiari[44] and Cayet[45] on the one hand and Herzog on the other, believe in the primary involvement of the blood vessels, the lesion being, according to the latter, a calcification of the blood vessel walls.

Allende Navarro upholds the Monakow views that the choroid plexi and the ependymal tissue represent a protective barrier for the nervous tissue and that the lesions following carbon monoxide are dominantly due to the involvement of the above mentioned barrier. Ruge believes that the action of carbon monoxide is a combined one and that besides a vasomotor paralysis with subsequent stasis, there is a specific action of the gas on the central nervous tissue as represented by a primary necrosis of the nerve cells.

Oppenheim[43] (1897) classifies the process in the category of irri-

The recent investigators show a tendency to admit the occurrence of pure functional vasomotor changes, thus approaching the viewpoint of Spielmeyer in his explanation of convulsive seizures occurring in epilepsy. Among the authors who have discussed and partly accepted this viewpoint are Hiller, Grinker, Weimann, and very recently, Meyer for whom, however, the pathogenesis is not a simple one but a more complicated process.

We must finally mention the experimental investigation of Cobb, Forbes and Fremont-Smith[46] who have reported an increased intracranial pressure following carbon monoxide poisoning. The conclusion of these authors which will be discussed in another part of this paper, throws some new light on the pathogenesis of the lesions following gas poisoning.

* * *

In our experimental investigations we have used illuminating gas instead of pure carbon monoxide as it was our aim to investigate the action of the gas which is most commonly connected with accidental death or the onset of a psychosis. As a matter of fact, the largest number of reports in human cases are related to the action of illuminating gas and only incidentally as for instance in the cases of Allende Navarro and McNally, was pure carbon monoxide the toxic agent.

In all our cases we have used rabbits which were placed in a closed chamber with glass front and back. Two tubes led to this chamber, one connected with a gas jet and one with an oxygen tank so that the gaseous content of the chamber could be varied according to necessity. One animal was exposed at a time.

The idea of using oxygen in combination with illuminating gas originated from the knowledge that CO tends toward a higher saturation of the blood when combined with oxygen. CO, according to Hill and Barcroft, combines more readily with unsaturated oxyhemoglobin than with hemoglobin, and hemoglobin will then take up more CO at a given tension if a little oxygen is present, than it will in the absence of the latter. Another reason for using oxygen is that since with the combination of oxygen and illuminating gas the animal resists convulsions for longer periods, the tissue of the central nervous system are exposed to CO for greater lengths of time.

In fact, if illuminating gas alone were used and the oxygen not turned on, the rabbit would have a convulsion in about 8 minutes but when oxygen was used, some of the animals resisted convulsions for as many as 50 minutes. Both gasses were conducted into the chamber for the same length of time, that is, for about 3 minutes at the pressure of any ordinary gas jet. The animal remained in the gas-filled chamber until a convulsion occurred and the respiration became weak and irregular. The time during which an animal was exposed to the gas varied with the concentrations of the chamber atmosphere. Some of the rabbits were given daily doses of gas, some others were exposed every other day and still others were exposed twice daily or even twice in the same afternoon. The time necessary to eliminate CO from the blood by respiration of pure air has not been definitely determined according to McNally, although Henderson reports that CO is practically eliminated in 3 to 4 hours while Kock still found CO in blood after 10 hours. Fishbein found residual gas even after five days. At any rate, a certain portion of hemoglobin is fixed by CO and before this is broken up, a further exposure raises the level of COHB in the blood (Stevens). We feel justified, therefore, in our chronic cases in occasionally having given gas twice in the same afternoon.

When the gas was turned on, the animal showed its awareness by lifting its head and sniffing about the box. After a few minutes, usually two or three, a marked vasodilatation of the veins of the ear could be observed and by this time the animal would be sitting or reclining quietly and breathing regularly but rapidly. The next sign of reaction that was noted was a swaying movement of the head and eventually of the entire body. Then the animal would fall on its side and immediately begin to dash and jerk about the chamber, thrashing heedlessly in a violent clonic convulsion. Just before this seizure the ear vessels were markedly dilated but toward the end, a vasocontriction was noted and as it ceased, there was a marked blanching of the ears. After this outburst the animal would lie unconscious on its side for a period varying from 1 to 3 minutes with ears blanched, eyes showing marked exophthalmus, nares dilating, and the entire body heaving with each inhalation. Often at this point there was incontinence of bladder and bowel. Then stiffening of the body occurred. The head would bend backward into a posi-

tion of such marked opisthotonus that head and lumbar spine were almost contiguous and all four paws would stiffen in extension. Next a slow but very rhythmical clawing movement of the fore-paws would occur. As this movement increased in intensity the rear paws participated in it in the same manner, thus simulating a stepping reflex. When it stopped, usually in a minute or so, the animal would lie limp and unconscious breathing slowly and regularly at first but later irregularly. As the respiration became too irregular, the rabbit was removed from the chamber and generally allowed to come naturally out of its unconscious state. The loss of function apparently occurred in ontogenetic order; brain, cord and medulla and the return of function occurring in the reverse order. After the stage of limpness in which the animal was in when removed from the chamber, if it were laid on its back in the experimentor's hand, the spine would be stiff, like a poker and the legs would be extended vertically or horizontally, right and left, unequally, depending upon the position of the animal's head. This was especially true of the fore-paws, thus closely resembling the phenomena of decerebrate rigidity.

Case Reports*

For our histological investigation we have used the following method: Half of the brain has been fixed in formalin, cut serially in order to detect possible changes in the whole length of the brain, cerebellum and medulla oblongata, and used for routine stains as the Sheldon Dyar for nerve cells, the hematoxylin eosin and the van Gieson. The other half has been used for frozen section studies including gold impregnation for neuroglia, silver impregnation for microglia and nerve fibers, stains for myelin sheaths and stains for the waste products of degeneration.

Rabbit 1. Gassed once and allowed to die in the chamber. The meninges appear hyperemic, especially over the convexity. No hemorrhages are disclosed either in the meninges or in the brain substance which discloses, however, injected blood vessels and capillaries. No areas of softening or other gross lesions either in the basal ganglia or in the brain stem are present. Microscopically, no changes are seen in the lamination of the cortex nor in the morphology of the single nerve cells. The neuroglia cells appear quite normal while the microglia shows here and there slightly swollen prolong-

* Twenty-five rabbits have been studied in our present investigation. Because of the duplication of some of the cases in regard to the time of gassing and the type of the lesions, the histological data of only 15 rabbits are reported.

ments. The small blood vessels of the cortex disclose also a slight degree of swelling of the endothelial cells.

Following a single gassing, it is rather difficult to establish any seat of election of the few mentioned changes. Nothing in particular are found in the medulla oblongata nor in the spinal cord. In the cerebellum, however, small areas of diapedesis are encountered in the white substance. The fat stain for degenerative products gives negative results.

RABBIT 2. Gassed twice on two separate days. Sacrificed during the second gassing. The meninges appear hyperemic, the blood vessels forming a quite prominent congested reticulum. No free hemorrhages are however detected either in the meninges, subarachnoid spaces or brain substance. The histological examination, reveals a well preserved lamination, although some of the nerve cells appear shrunken with a deeply stained and at times deformed nuclei. The nerve cell involvement resembles the so-called chronic type of lesion in which conglomeration of the Nissl bodies has been reported as well as deeply stained and pyknotic nuclei. Other cells, however, appear swollen with poor staining properties of both nucleus and chromatin substance with occasionally a few vacuoles in the cytoplasm. The cellular involvement is accompanied by a slight amount of neuroglia reaction. The distribution of the lesions is not yet uniform but the rhinencephalon seems to disclose a larger number of affected cells, some of which appear to undergo an advanced process of liquefaction. We have not been able to detect correspondingly any particular ameboid change of the neuroglia cells. The caudate nucleus and the frontal part of the lenticularis do not show appreciable changes while in more caudal sections some of the cells of the globus pallidus are the seat of acute degenerative changes of various intensity ranging from the simple swelling to a more advanced degree of degeneration. Changes of the nerve cells are quite diffuse over the infundibular region, the hypothalamus and the corpus of Luys. In the mesencephalon the substantia nigra is affected especially in its lateral portion. The corpus quadrigeminum anterior is more severely affected than the surrounding areas, the lesions involving most of the outer lays of nerve cells. The lesions are at this level dominantly of the swollen type and in some instances leading to the liquefaction of the cell body.

The Ammon's horn is markedly congested, especially in the area separating the hippocampus from the fascia dentata. While the small granules of the fascia are not involved, the lamina pyramidalis of the Ammon's horn is the seat of a diffuse degenerative process. In some sectors the pallor of the nervous tissue contrasts with the congestion of the continguous areas. The neuroglia reaction in both the diencephalon and Ammon's horn is for the most part of the hypertrophic type. Slight hypertrophy of the neuroglia

Fig. 1. Cells of the lobus olfactorius anterior. Swelling of the cell body and vacuolar disintegration. Sheldon Dyar stain. Magnification 1000

is also located in the caudate nucleus and along the lamina terminalis. In contrast with this hypertrophic change, occasional degenerative changes of the neuroglia are found here and there in the rhinecephalon and more markedly in the subependymal layer of the lateral ventricle. The choroid plexi disclose a swollen epithelium while only occasionally are capillary hemorrhages found. The small cortical blood vessels are the seat of a moderate endothelial swelling.

In the spinal cord the meninges show hyperemia which is also evident in the gray substance, especially surrounding the central canal. The cells of the anterior horn are slightly involved, while more marked changes of the swollen type are seen in the cells of the posterior horn. Myelin sheath preparations fail to disclose appreciable amount of change in both brain and spinal cord with the exception of a certain degree of swelling in the posterior roots where a certain amount of swelling of the axones is also noticeable.

RABBIT 3. Four gassings in 9 days. The animal was kept alive for two days following the last gassing. The brain and spinal cord meninges do not appear congested. No hemorrhages are detected either in the meninges or in the nervous parenchyma. Histological examination reveals diffuse acute changes of the nerve cells, especially located in the rhinencephalon. The lesions consist in a more or less marked swelling of the cell body, presence of vacuole and disappearance of the Nissl bodies. The nucleus is at times deeply stained and at others has lost its staining properties, being swollen and occasionally disintegrated (Fig. 1). Here and there especially in the corpus quadrigeminum anterior, the nerve cells instead of being swollen appear shrunken with a deeply stained nucleus while the Nissl bodies have lost their staining properties. The changes of the swollen type are for the most located in the lobus olfactorius anterior and in the Ammon's horn, where they affect dominantly the lamina pyramidalis. Diffuse lesions of the nerve cells are also found in the periventricular region of the diencephalon, in the region of the tuber cinereum and in the nucleus supraopticus. In the upper portion of the ventriculus diencephali a kind of dedifferentiation of the ependymal cells seems to occur as the cells at this level appear as ependymal spongioblasts with one of the prolongments attached to the ependymal wall. In the thalamus the lesions are quite definite in the area of the ganglion habenula, numerous cells of which disclose the swelling and vacuolar type of lesions. No particular changes are noticeable in the striatum although the cells of the caudate nucleus appear paler than normal. In the pons the lateral nuclei appear slightly swollen. The medulla oblongata is normal but the spinal cord discloses disintegration of a few cells of the anterior horn. In the cerebellum the layer of Purkinje cells is affected, some of the cells being the seat of an acute swelling while others are considerably shrunken.

The neuroglia cells react in all the above involved areas with changes of both progressive and regressive type. Tendency to hypertrophy and hyperplasia is more marked in the Ammon's horn. The microglia also reacts by the swelling of its body (Figs. 2 and 3) and in this connection it is important to emphasize the fact that the swelling of these elements closely resembles the same change occurring in the oligodendroglia cells. The nerve fibers appear somewhat swollen.

In the ectomesodermic barrier, the subependymal layer (third ventricle) discloses acute degenerative changes of the astrocytes and of the micro— and oligodendroglia cells. The choroid plexi are lined with swollen epithelium which here and there is the seat of advanced vacuolization and disintegration.

RABBIT 4. Six gassings in 17 days. This animal was not killed under the action of the gas but died the day after. No definite congestion of the meninges nor of the brain tissue can be detected. The dura is, however slightly thickened over the posterior portion of the interhemispheric fissure. At this stage the histological lesions of the nerve cells are also represented by the swollen type with presence of more or less numerous vacuoles. The lesions range from a moderate swelling of the cytoplasm to the entire liquefaction and disintegration of the nerve elements. Even at this stage, there is not, accompanying this type of lesion, a definite neuroglia reaction of the ameboid type as described by Nissl and Spielmeyer in the so-called "severe type of nerve cell lesions" nor are the characteristic ring formations commonly found in these lesions present in the cytoplasm. Nevertheless, the nerve cell may undergo a process of complete liquefaction closely resembling the *Verflüssigung* of the German authors. At this stage also the lesions occupy for the most part the anterior and posterior olfactory lobes, the lobus piriformis and the Ammon's horn. In the lobus olfactorius posterior the ganglia olfactoria are quite severely affected and in the Ammon's horn the most involved region is the Sommer sector and the cells of the lamina pyramidalis. The division between Ammon's horn and fascia dentata is quite loose and is the seat of disintegrative change. The nucleus habenula and corpus mammillaris which belong to the olfactory system are also diffusely affected. The lesion in the infundibular and hypothalamic region is of similar extent to the one described in the previous case. In the striatum (neo— and paleostriatum) more or less severely affected nerve cells are scattered throughout although the process seems to affect more severely the globus pallidus. The nerve cells are also largely involved in the corpus geniculatum laterale and in the two colliculi, especially in the anterior one. The pontine nuclei are here too, involved to a certain extent as are the Purkinje cells of the cerebellum. No striking changes in the medulla oblongata are present.

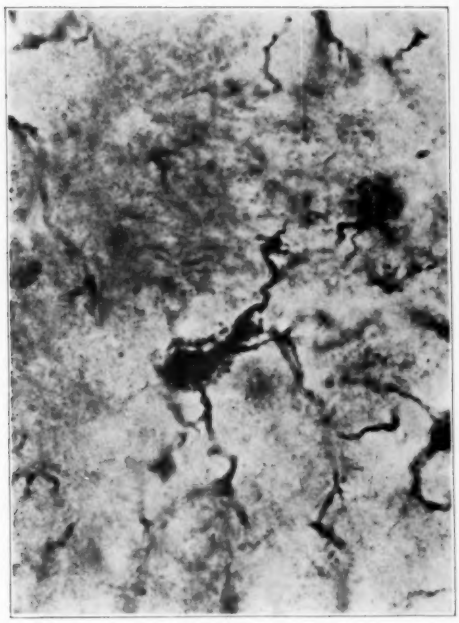

Fig. 2. Swelling of the microglia. Del Rio Hortega silver carbonate method. Magnification 1000

Fig. 3. Swelling of the microglia. Del Rio Hortega silver carbonate method. Magnification 1600

The neuroglia cells disclose progressive and regressive changes. The cells appear enlarged with bigger and thicker prolongments. An increase in number of the cells is detectable especially surrounding the blood vessels (perivascular gliosis). The tendency to gliosis is a marked one in the region of the Ammon's horn. The acute degenerative changes of the neuroglia are here also detected in areas where the nervous tissue is in closer contact, so to speak, with the changes occurring in the cerebrospinal fluid mass (periventricular areas). The microglia cells react also either by swelling of the cell body or by a more generalized hypertrophy of the cytoplasm and of the prolongments.

The lining epithelium of the ependymal walls is swollen, here and there, completely disintegrated. The same changes are disclosed in the choroid plexus of the region. In the spinal cord nerve cells of the anterior horn are seen undergoing the same type of vacuolar disintegration as described in the brain parenchyma. Surrounding the central canal a beginning gliosis is manifest.

RABBIT 5. Seven gassings in 20 days. The animal was sacrificed one week after the last gassing. The new pathological feature of this stage is the presence of small areas of softening which are encountered in the thalamus, the hypothalamus, the corpus of Luys, the substantia nigra and the formatia reticulata tegmenti. These areas of softening show nothing of particular moment their histological structure being the one commonly encountered in cases of vascular lesions. Although in the animals where death followed immediately after the gassing, acute swelling of the endothelium of the blood cells was a common finding in both the cortex and the brain stem. In this case where death occurred one week after the last gassing, however, nothing of this kind is noticeable nor is there any definite sign of an endarteritic process of the proliferative type. In the central area of softening numerous gitter cells are found loaded with fatty degenerative products. Surrounding the central area metamorphosis of microglia is quite definite, the cells undergoing a gradual change into "scavenger cells." Fat material is present in the microglia cells even in the very early stage of reaction. In the immediate vicinity of the lesion swollen microglia can be detected while these are absent in other regions. Besides the softenings there are as in the previous cases, diffuse lesions of the nerve cells scattered through the cortex but with the same predilection as already mentioned for the rhinecephalon and Ammon's horn. In this case the lesions of the nerve cells are more pronounced in the corpus mamillares, the ganglion habernulae, the nucleus basale opticum and the infundibulum. The nerve cells of the caudate nucleus, putamen and thalamus are also the seat of a certain amount of swelling but the involvement is less pronounced than in the above men-

tioned area. No areas of softening are encountered in this ganglia. In the mesencephalon the substantia nigra discloses reaction of the nerve cells which involve especially its lateral portion bordering with the corpus geniculatum mediale which is also the seat of acute swelling and occasionally disintegration of the nerve cells. The pontine nuclei are also the seat of changes which are more pronounced than in the previous cases. The cerebellum is rather severely involved and numerous Purkinje cells are shrunken and poorly stained while a few others appear swollen, undergoing a gradual disintegration through the state of vacuolization. The cells of the lamina pyramidalis of the Ammon's horn are severely affected (Fig. 4) while the granules of the fascia dentata appear grossly normal. In the Ammon's horn the neuroglia reaction is very pronounced and mostly of the progressive type. In the area between the Ammon's horn and fascia dentata, there is even a pronounced gliosis (Fig. 5). Acute degenerative changes of the neuroglia are quite pronounced in the subependymal layer of the third ventricle where the neuroglia cells appear deformed, at times swollen, and at other times shrunken with processes undergoing clasmatodendrosis (Fig. 6).

The nerve fibers appear swollen in the white matter especially in the internal capsule where some of the so-called grapelike areas of disintegration (Buscaino) are encountered. The swelling of the nerve fibers is often accompanied by a breaking of the myelin sheath which fact is well evident in Spielmeyer's preparation. Choroid plexi and ependymal lining cells disclose the same involvement as already described in previous cases.

Rabbit 6. Eight gassings in 35 days. The animal was sacrificed under the last gassing. The meninges of both brain and spinal cord disclose marked signs of congestion. The particular feature of this case is the occurrence of a certain amount of endarteritis of the proliferative type in the small blood vessels of the cortex as well as of other central structures. In some instances the lumen of the blood vessel is more or less reduced in size while in a few others occlusion seems to have taken place. We must, however, add that we have been unable to establish a relationship between the vascular changes, the nerve cell lesions and the areas of softening.

The nerve cells disclose the usual peculiar type of degeneration represented by swelling of the body, vacuolization and more or less pronounced liquefaction. These changes are quite pronounced in the area retrosplenialis where the second layer of cells shows the most diffuse lesions. The rhinencephalon and other structures belonging to the olfactory system are also quite severely involved. In the Ammon's horn there is besides, a marked congestion and the tissue appears very loose in structure. In this location numerous grape-like areas are detectable. These peculiar areas are also found in the hypothalamic region, in the mesencephalon and in the rhombencephalon. In

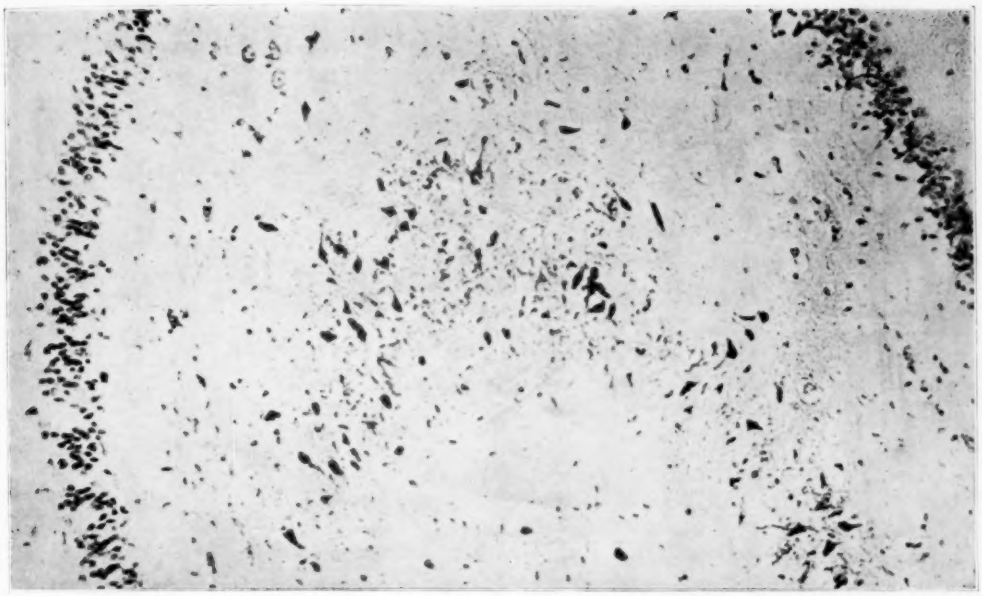

Fig. 4. Diffuse lesions of the lamina pyramidalis of the Ammon's horn. Sheldon Dyar stain. Magnification 125

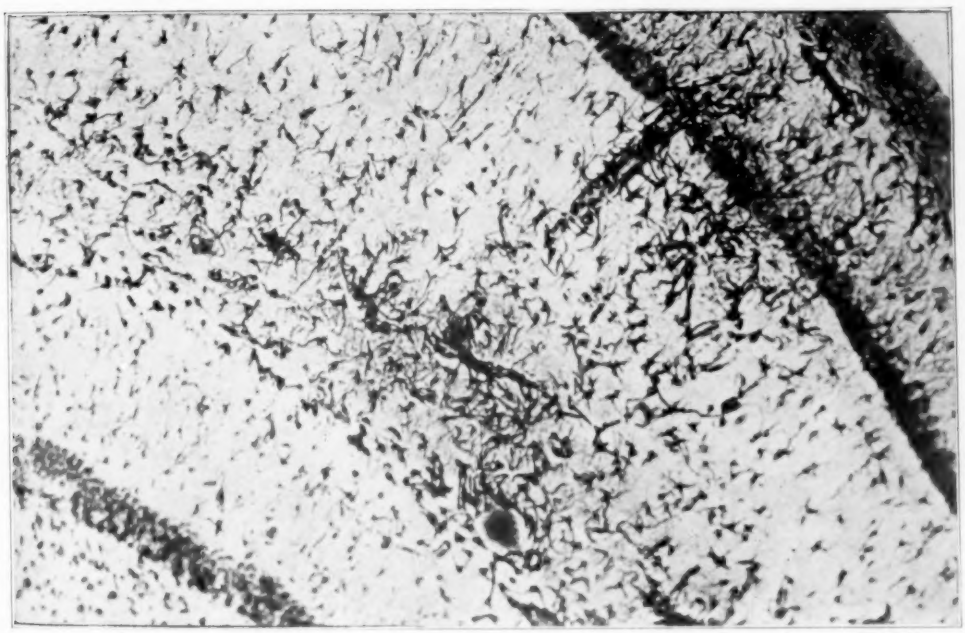

Fig. 5. Gliosis of the Ammon's horn. Cajal gold sublimate method. Magnification 150

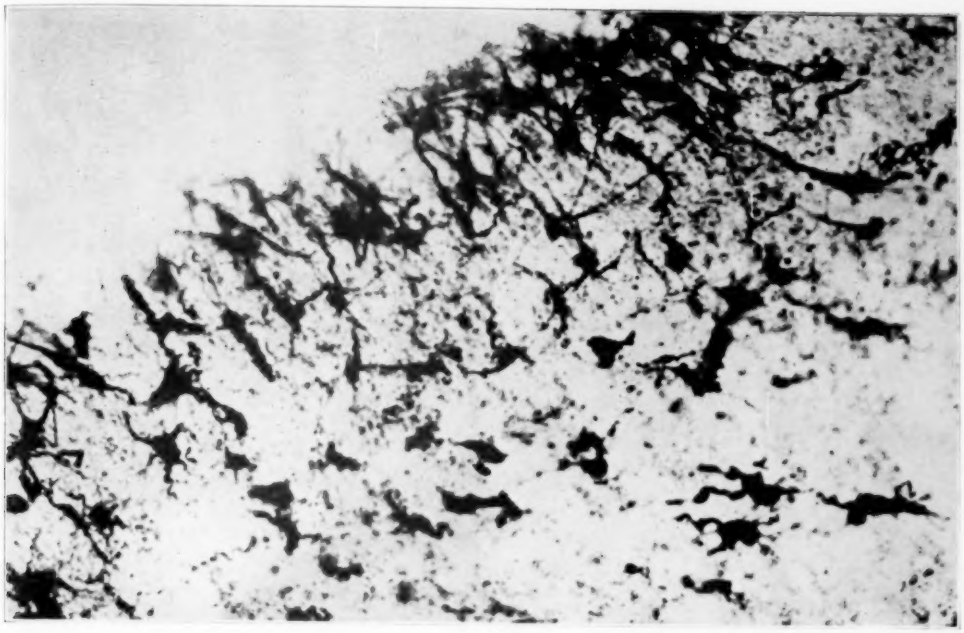

Fig. 6. Acute changes of the neuroglia in the sub-ependymal layer of the III ventricle. Cajal gold sublimate. Magnification 250

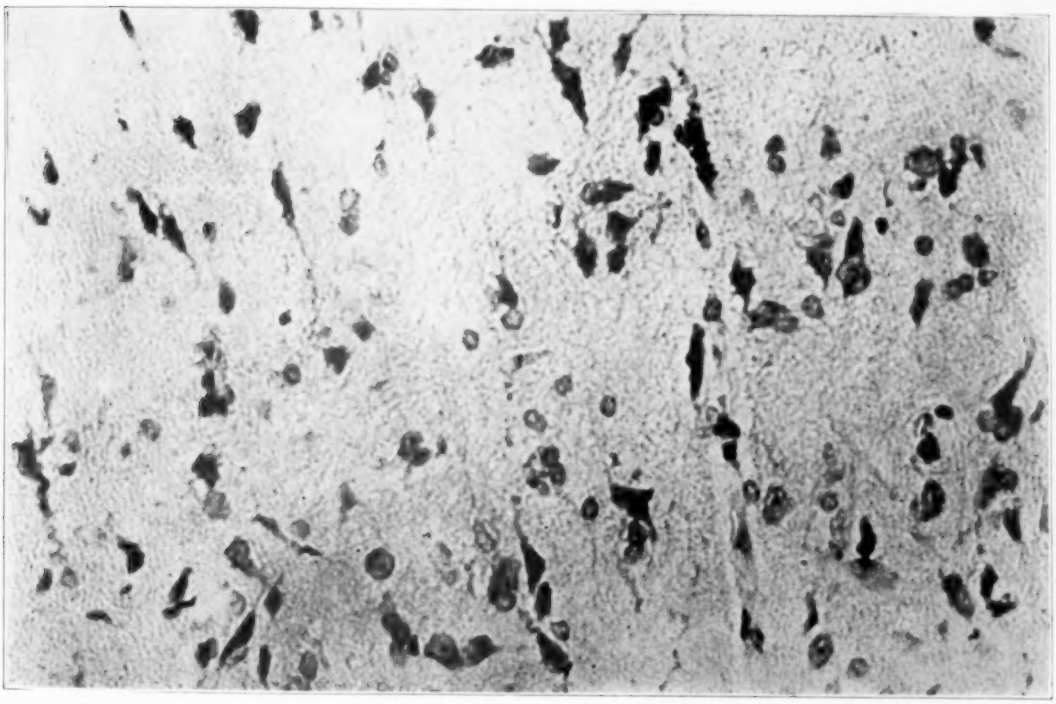

Fig. 7. Shrinkage of the nerve cells in the corpus quadrigeminum anterior. Lesions of the so-called chronic type. Sheldon Dyar stain

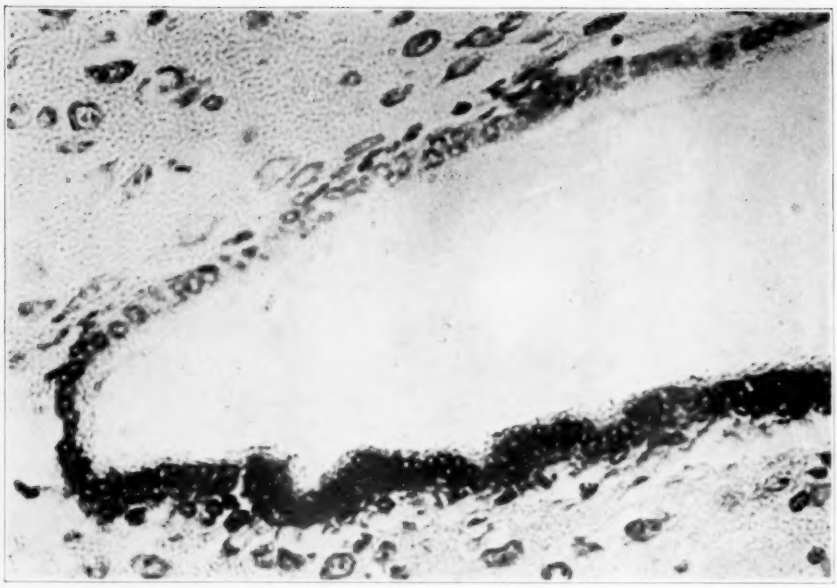

Fig. 8

Fig. 8. Disintegration of the lining ependymal cells on one side and stratification of the cells on the opposite side. Sheldon Dyar stain. Magnification 250

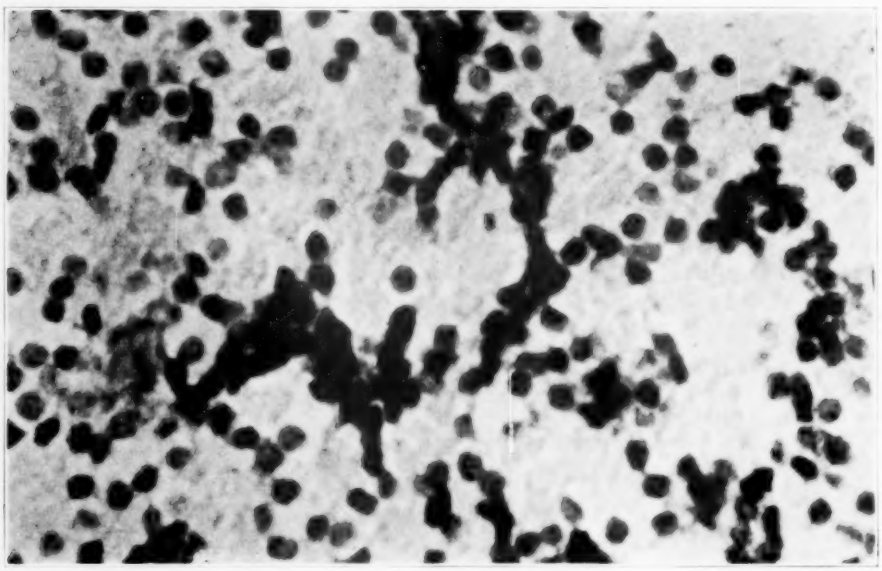

Fig. 9

Fig. 9. Conglutination of the granules in the area granularis of the cerebellum. Sheldon Dyar stain. Magnification 750

the hypothalamus the nuclei of the infundibular region and especially the nucleus supraopticus are severely damaged. The striatum is the seat of nerve cell degenerative changes but no areas of softening are located there. In the corpus quadigeminum anterior several elements appear shrunken with pyknotic nuclei and tortuous prolongments recalling the type of lesion known as the shrinkage of nerve cells or chronic type of lesion. A few areas of softening are encountered in the cortex, in the diencephalon and the mesencephalon. The neuroglia reaction all over the cortex is quite evident and in the Ammon's horn nodule formations are encountered. The microglia follows the general type of reaction, the cells being hypertropic with enlarged prolongment, some of which are quite huge. Swollen microglia and oligodendroglia cells are also encountered. The lining epithelium of the lateral ventricle is the seat of degenerative changes leading to disintegration and disappearance of the lining membrane. On the other hand places are seen where the cells undergo proliferation leading to a stratification of the ependymal walls (Fig. 8).

The cerebellum, although disclosing no areas of softening, is the seat of a pronounced involvement of the Purkinje cells which appear shrunken and very poorly stained. In the layer of the granules there is a peculiar change represented by conglutination of the different elements. In fact, the granules seem to have lost their individuality and appear to fuse in clusters where the contours of the single elements are no longer detectable (Fig. 9). The reaction of the neuroglia is quite marked, especially in the lamina molecularis where the neuroglia discloses most of its hypertrophic changes. The spinal cord is the seat of small hemorrhagic foci surrounding the central canal. The nerve cells of the anterior horn appear swollen, vacuolated and some of them are in advanced stages of disintegration. The spinal roots, especially the posterior ones are the seat of degenerative changes represented by swelling of the myelin sheaths which here and there appear broken, and by more or less advanced swelling of the nerve fibers some of which are entirely degenerate.

RABBIT 7. Twelve gassings in 14 days. The animal died five days after the last gassing. There is no hyperemia of the meninges nor of the brain and spinal cord. The soft meninges disclose, however, a certain amount of thickening in the region of the occipital-parietal lobe. The histological picture does not vary essentially from rabbit Number 6 with the exception that swelling of the microglia is rarely encountered. Although the impregnation of the oligodendroglia is quite difficult in the rabbit, we may state that there was very little change in the sense of a swelling of this element. The nerve cells are diffusely affected in the precentral area in the regio insularis and in the regio olfactoria. The type of lesion is essentially the same as already

described, that is, a swelling with a tendency towards liquefaction. The second and third layers seems to be the most affected portion of the cortex. In the thalamus the anterior nucleus and the ganglia habenula seem to have suffered the most while the lateral portion of the ganglion appears well preserved. The hypothalamus the paraventricular region, the infundibular region and the region of the ganglion supraopticus and the corpus mammillaris (Fig. 10) are the regions most severely affected. In the mesencephalon the substantia nigra is involved in its lateral portion corresponding to the external lateral nucleus. The red nucleus shows well preserved cells while in its surroundings several grape-like areas of disintegration are disseminated. In the corpus quadrigeminum anterior the nerve cells are the seat of changes of the vacuolar type but besides, many cells appear shrunken and poorly stained, thus recalling the type of lesions resulting from ischemia. The posterior colliculus is also affected as the nuclei of the pons are. The lenticular nucleus, although disclosing marked lesions of its cells, especially in the globus pallidus is apparently free from areas of softening while these softenings are often encountered in the formatio reticulata of the pons. The cerebellum discloses diffuse degenerative changes of the Purkinje cells and slight degree of conglutination of the granular layer. The changes of the Ammon's horn closely resemble the one already described in the previous case, differing only in a less pronounced congestion of the blood vessels.

The neuroglia, mainly the astrocytes, are markedly hypertrophic, especially in the thalamus, lenticular nucleus and hypothalamus. Accompanying the proliferative changes, degenerative changes are also encountered which are best detected in the periventricular area and in the region of the nucleus supraopticus and corpus mamillaris where acute degeneration and classmatodendrosis of the astrocytes are found. The microglia reaction accompanies the astrocyte reaction and is mainly of the proliferative type, although in the areas of softening the common finding of transitory stage to gitter cell formation is definite. In such limited lesions the reaction of the oligodendroglia cannot very well be studied. Fat products of degeneration are found in the surroundings of the areas of softening as well as in some cortical areas where the nerve cell degenerative process is more pronounced. Even in the meninges some fat material is found either free or imbedded in scavenger cells. Bielschowsky's method of impregnation for neurofibrils discloses an acute swelling of the axone, swelling of the myelin sheaths and its gradual breaking down and disintegration. The degenerated fibers are for the most part localized in the internal capsule, in the fornix and in the lateral column of the spinal cord.

In the spinal cord occasionally, diapedesis is found surrounding the central canal but no areas of softening are encountered. The blood vessels appear

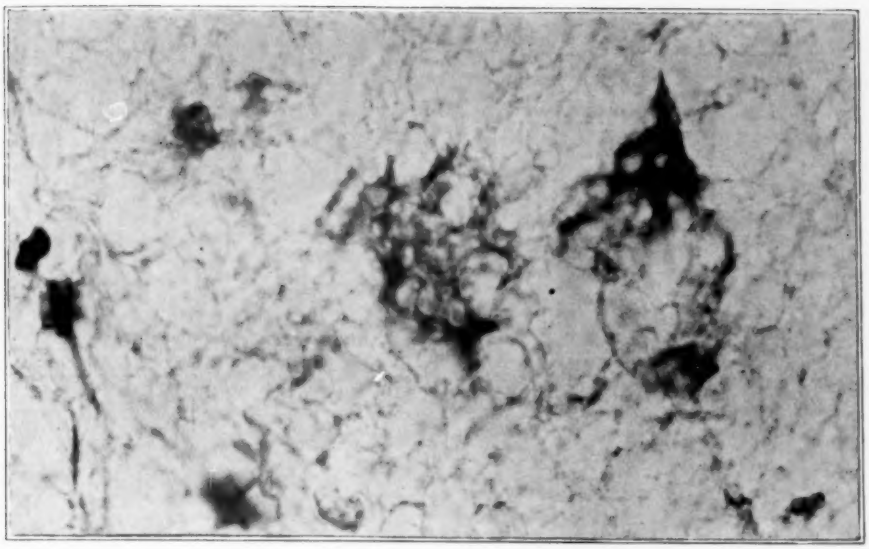

Fig. 10

Fig. 10. Advanced liquefaction of two cells of the nucleus magnocellularis of the mamillary body. Sheldon Dyar stain. Magnification 1000

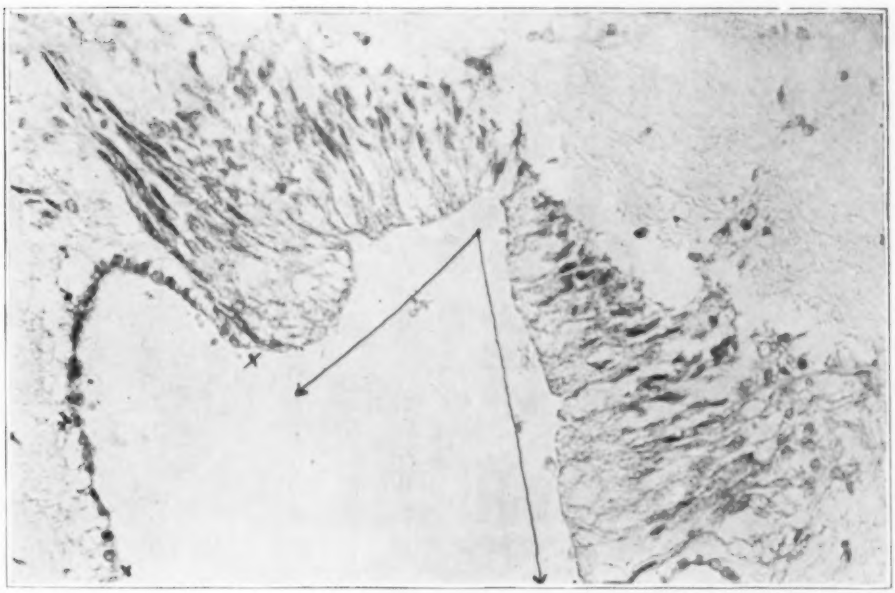

Fig. 11

Fig. 11. Dedifferentiation of the ependymal lining cells. Sheldon Dyar stain. Magnification 250

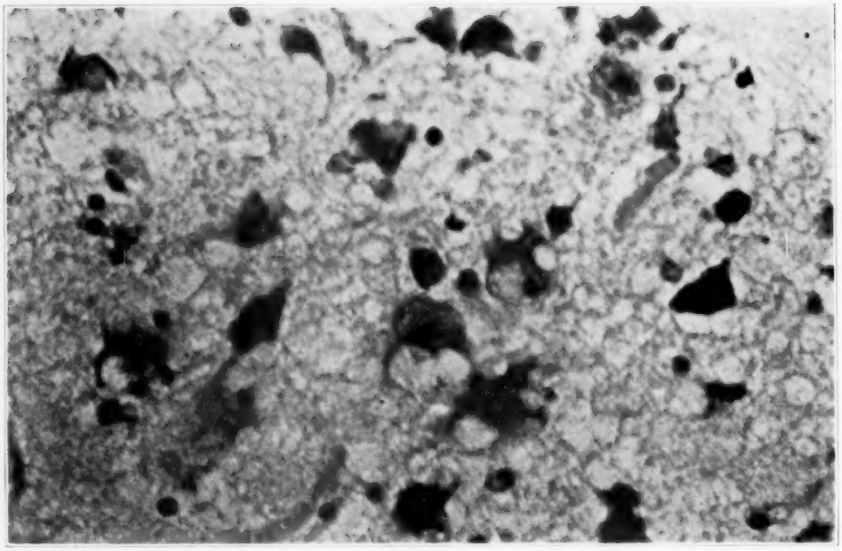

Fig. 12

Fig. 12. Vacuolization of nerve cells in the lateral pontine nucleus. Sheldon Dyar stain. Magnification 500

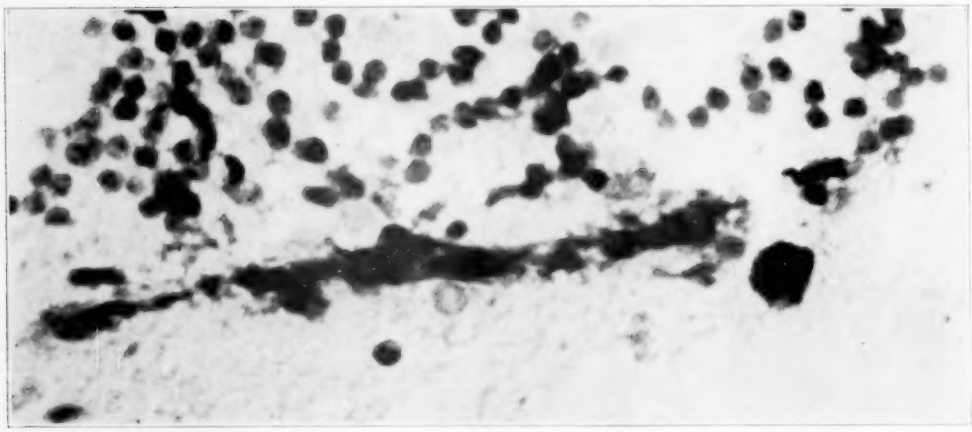

Fig. 13

Fig. 13. Very pronounced shrinkage of Purkinje cells which have lost their normal polarity. Sheldon Dyar stain. Magnification 750

free from definite pathology and nerve cells of the anterior horn are here and there the seat of acute degenerative changes. Both anterior and posterior roots disclose involvement of nerve fibers and myelin sheaths.

In the ectomesodermic barrier the lining epithelium of the lateral ventricle as well as of the third ventricle is only slightly affected although in some areas a definite destruction of cells is encountered. In the dorsal portion of the third ventricle an area of apparent dedifferentiation of ependymal cells into more primitive elements seems to have taken place (Fig. 11). The choroid plexi are the seat of degenerative changes as represented by swelling and disintegration of the lining epithelium. Interstitial connective tissue appears increased but no inflammatory changes are reported.

RABBIT 8. Fifteen gassings in 40 days. The animal was sacrificed under the action of the gas. The meninges are congested and somewhat thickened. The main feature in the meninges is the appearance at this stage of a slight perivascular infiltration. The cortex as usual, is the seat of diffuse degenerative changes of nerve cells in its outer layer. In this case the pre and postcentral areas, the area insularis, the area temporalis and the lobus piriformis are essentially affected. The ganglia olfactoria of the lobus olfactorius posterior are markedly involved. The lamina pyramidalis of the Ammon's horn is very severely affected and lesions extend to the area pre-subicularis and area subicularis. A pronounced edema is found in these areas. In the corpus striatum, the perineuronal spaces are markedly dilated but the degenerated cells are not very numerous. Conversely, in the claustrum, more severe lesions of the vacuolar type affect the nerve cells of this rgion. The infundibular, the paraventricular area, the nucleus supraopticus and the corpus mamillaris are severely damaged as in the previous case. The same holds true for the anterior colliculus. In the thalamus the habenular region is the one involved while in the hypothalamus the corpus of Luys appears slightly damaged. In the metathalamus the corpus geniculatum laterale is the seat of diffuse cellular changes. The substantia nigra and the corpus geniculatum laterale appear exempt from definite involvement. In the pons, the lateral nuclei are markedly affected, numerous cells undergoing an advanced process of disintegration (Fig 12). In the cerebellum the Purkinje cells are very severely damaged and the type of lesion is a combined one of the swollen and ischemic type. Some of the cells are so markedly shrunken that they have lost their normal orientation appearing horizontally stretched as a deeply stained line (Fig. 13). The conglutination of the small cells of the granular layer is quite pronounced. In the medulla oblongata the acusticus and vestibular nuclei show degenerative changes while only a few cells are degenerated in the area of the tenth nucleus. Small areas of softening are found in the lateral portion of the thalamus, in the globus palli-

dus, in the putamen, in the pons and in the pre and post-central areas. In the ectomesodermic barrier the same changes as reported in the previous cases are found with the exception of the mentioned area of dedifferentiation.

The neuroglia reaction is dominantly of the hypertrophic and hyperplastic type and appears diffusely over the areas in which nerve cell lesions have been encountered. It seems, however, that in the diencephalon the thalamic and hypothalamic regions are more markedly involved while the lenticular nucleus is less affected. It must be said, however, that the caudate nucleus and the claustrum disclose a greater astrocyte reaction. Here and there glia nodules are found. In the corpus geniculatum laterale areas of pronounced gliosis are also encountered (Fig. 14). In this case also acute degenerative changes of the same type reported in previous instances are found in the periventricular region. The microglia reaction does not differ from the previous case with the exception that here several elements are found to be the seat of a preliminary swelling. The grape-like areas of disintegration are found in the internal capsule, putamen and Ammon's horn. In the brain the small blood vessels of the cortex disclose here and there a certain amount of swelling of the lining epithelium. Besides, here and there, a process of endarteritis is present but no inflammatory changes are disclosed. The fat products of disintegration are located as usual in the center of necrotic areas and their immediate vicinity, although the cortex and the meninges do slightly participate in the *Abbau* process. In the spinal cord the changes are quite identical to the one previously reported.

Rabbit 9. Sixteen gassings in 16 days. The meninges are slightly thickened and are the seat of inflammatory changes consisting of free and perivascular exudate surrounding the blood vessel. Inflammatory changes are present also in the cortex and in the white substance. The blood vessels are congested especially in the external cortical layer, and in the choroid plexus. In the cortex (lobus olfactorius anterior and posterior, lobus piriformis, pre and post-central area and temporal cortex) the cellular involvement is represented by a swelling of the cell body with poorly stained nucleus and poorly stained cytoplasm. Other cells appear vacuolated and others are undergoing a gradual process of liquefaction. This same type of lesion is also found in the internal portion of the thalamus and in the infundibular region where the paraventricular nuclei, the nuclei of the tuber cinerium and the nucleus supraopticus are quite severely involved. The striatum is also the seat of diffuse cellular changes. No areas of softening are, however, disclosed in the putamen nor in the globus pallidus. Conversely, several areas of softening are found in the post-central area and in the lobus olfactorius posterior. A small area of softening is also found over the lateral nucleus of the thalamus and another one in the mesial portion of the substantia nigra. Sur-

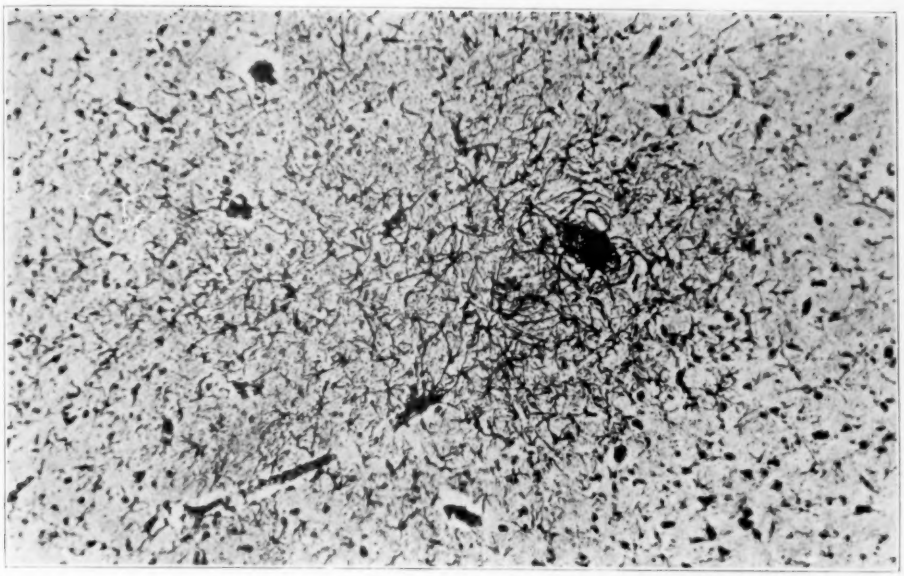

Fig. 14

Fig. 14. Area of gliosis in the corpus geniculatum laterale. Cajal gold sublimate. Magnification 65 (?)

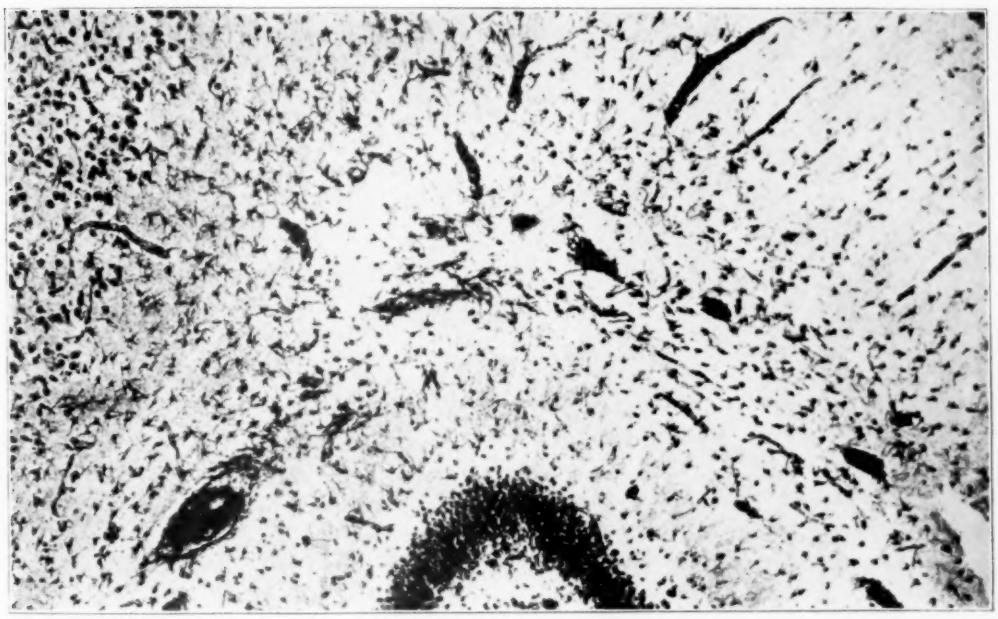

Fig. 15

Fig. 15. Glia proliferation in the Ammon's horn. Perivascular gliosis. Cajal gold sublimate. Magnification 150

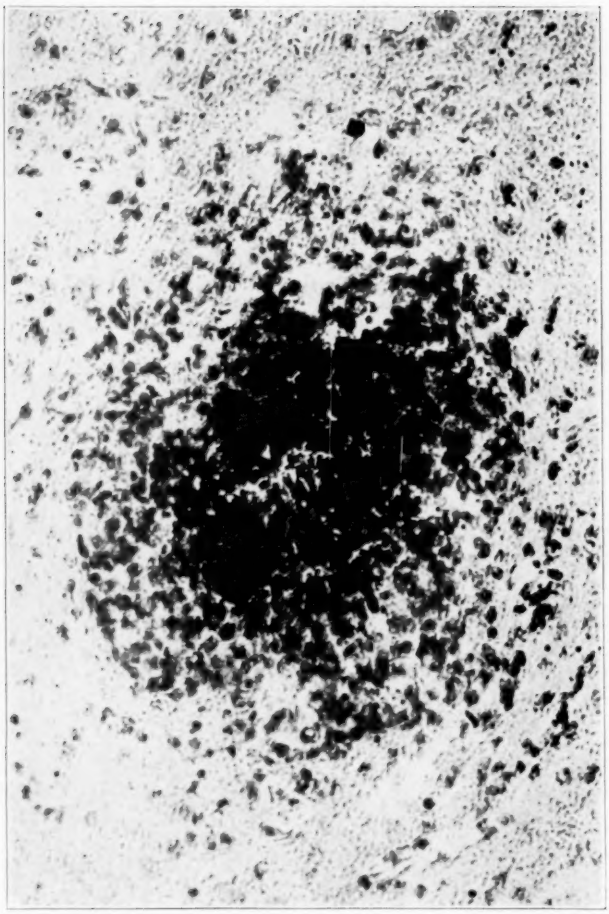

Fig. 16. Fat tissue free or embedded in scavenger cells in the central area of a softening. Scharlak R and hematoxylin. Magnification 250

rounding the red nucleus on the right side another small area is encountered which, however, does not affect directly the above mentioned nucleus. In the Ammon's horn the nerve cell changes are more pronounced and there the blood vessels are congested and surrounded by a pronounced perivascular exudate. In the corpus quadrigeminum anterior the cellular lesion of the swelling type are also diffuse and intercalated with shrunken cells the cytoplasm of which is poorly stained. In the pons the lateral pontine nuclei are affected while in the cerebellum only a very small area of softening is found in the vicinity of the dentate nucleus. There the cells are also swollen, but it is in the cerebellar cortex that the lesions are the most pronounced as they specially affect the granular layer and the layer of the Purkinje cells. In the granular layer the pathological changes described as conglutination is the most frequently encountered.

The neuroglia reaction is quite severe all over the cortex and of course. much more pronounced around the areas of softening where the hypertrophic changes of the astrocytes are definite. There is, besides, a microglia reaction which leads to the formation of numerous scavenger cells in the areas of softening while in the other regions leadings to the hypertrophy of the cell body and of its prolongments. In the surroundings of some of the areas of softening, especially when they are located in the cortex, a certain amount of swelling of the oligodendroglia is also detectable. We presumably deal here with the most recent areas. Some of the microglia cells are also swollen, thus rendering somewhat analogous the process affecting microglia and oligodendroglia. The reaction of the neuroglia, i. e., the proliferative type, is more pronounced in the thalamus, hypothalamus and metathalamus. It is peculiar to note that the tractus peduncularis transversus discloses both proliferative and degenerative changes of the neuroglia. These degenerative changes are also encountered in the periventricular region in combination with the marginal gliosis which is found here and there. Fat is quite abundant in the areas of softening (Fig. 16) and in the surrounding blood vessels where it seems located free or embedded in the vascular sheaths themselves. The spinal cord is surrounded by congested meninges in which inflammatory changes are also detected. The central canal is dilated and surrounded by reactive neuroglia. The nerve cells of the anterior horn but especially the ones of the posterior horn, are undergoing acute degenerative changes with gradual transition toward liquefaction. No areas of softening are, however, disclosed. The nerve fibers are swollen and the seat of a fragmentation especially in the internal capsule and in the spinal roots. The ventricular ependyma, especially of the lateral and third ventricle is swollen and the cells are here and there entirely disintegrated. In a few places a proliferative change, leading to the formation of a stratified epithelium is present. The choroid

plexi disclose numerous swollen and degenerated cells and a certain amount of reaction of the interstitial connective tissue which is somewhat increased in amount.

RABBIT 10. Twenty-five gassings in 40 days. The animal was sacrificed under the action of the last gassing. The meninges appear congested but no free hemorrhages are found. Dura and leptomeninges are definitely thickened. Histologically, the most striking feature is the presence of diffuse inflammatory changes. Blood vessels are, in fact, surrounded by collars of lymphocytes among which several plasma cells are scattered. The inflammatory reaction is encountered also in the brain cortex as well as in the white matter and other central formations (Fig. 17). The areas of softening are quite numerous and scattered throughout the different cortical areas but involving especially the lobus olfactorius posterior, the lobus piriformis, the pre-central area and the area retrosplenialis and temporalis. In the diencephalon the nucleus anterior thalami is the seat of a small area of softening and softenings are also encountered in the caudate nucleus, in the putamen, in the hypothalamus, the internal capsule and in the formatio reticulata alba of the pons. Histologically the areas of softening do not differ from what has already been described in previous stages except for the microglia reaction which seems to cover a larger radius. Even at a distance from the central necrosis (Fig. 18), the cells are hypertrophic some of them presenting a swelling of the body. In the globus pallidus, although no softenings are disclosed, the nerve cells are undergoing a gradual disintegration while the microglia reacts by hypertrophy of its element. The astrocytes are hypertrophic all over the affected areas but especially in the vicinity of the areas of softening. This reaction, however, appears independent of the softenings and may be marked in regions where no obstruction of the tissue takes place. The area which is certainly the most severely damaged is the Ammon's horn where both nerve cell and neuroglia disclose combined degenerative and proliferative changes. About the surrounding blood vessels of the region, there is a marked perivascular gliosis, and at the ventricular aspect of the thalamus a marginal gliosis is detectable (Fig. 19). The fatty degenerated products are seen free in the tissue or embedded in the scavenger cells or in the microglia cells undergoing gitter cell transformation. In the blood vessels free fat particles or conglomerate fat masses seem to occlude the vascular lumen thus giving the impression of fat emboli (Fig. 20) as already described in other pathological conditions (Cornwall). In the cerebellum, medulla oblongata and spinal cord, the lesions do not essentially differ from those previously described, with the exception of the inflammatory changes which are lacking in previous stages. The blood vessels are the seat of an endarteritic process involving especially the small cortical ones.

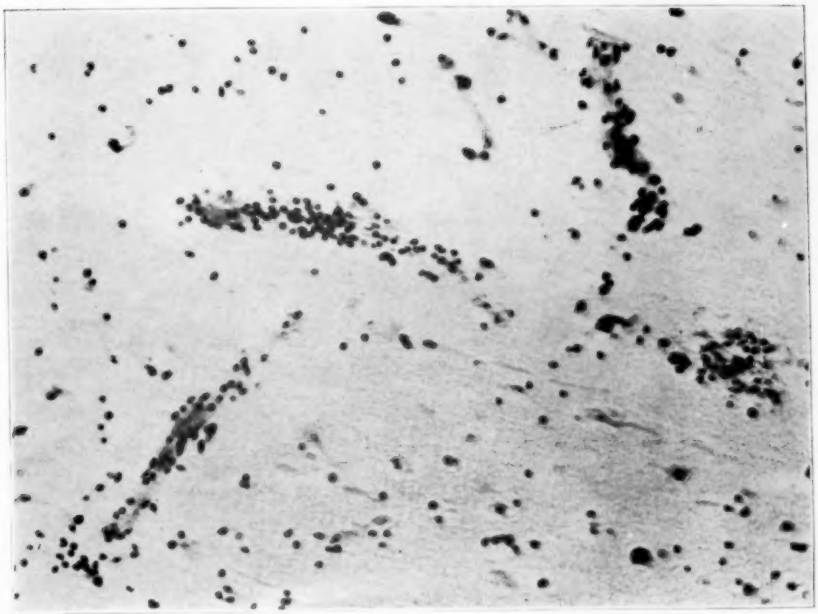

Fig. 17. Inflammatory exudate in the sub-cortical pre-central area. Sheldon Dyar stain

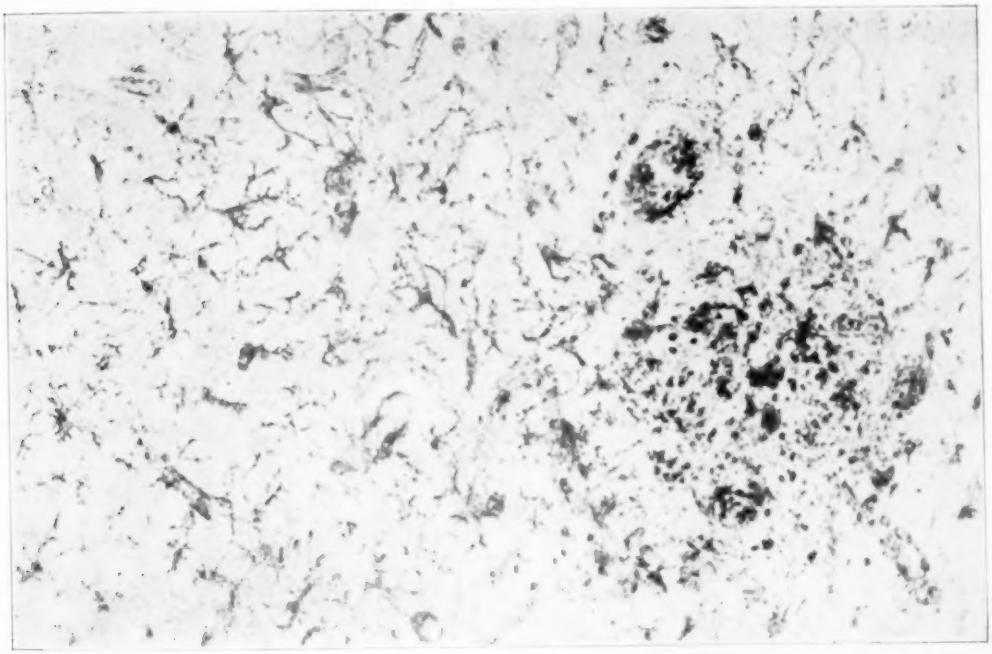

Fig. 18. Area of softening with microglia reaction surrounding the area. Del Rio Hortega silver carbonate. Magnification 250

Fig. 19. Area of marginal gliosis in the thalamus. Cajal gold sublimate. Magnification 250

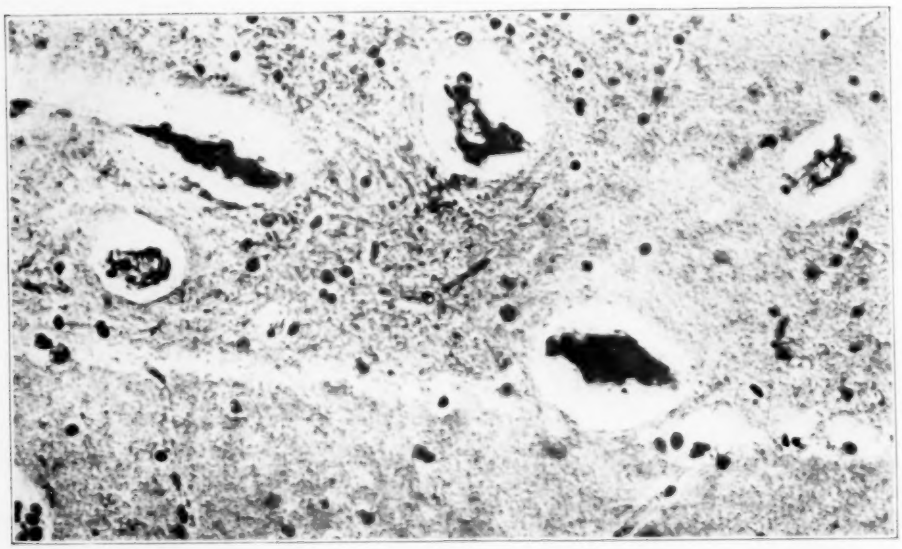

Fig. 20. Fat emboli in the blood vessels of the Ammon's horn. Sharlack R stain

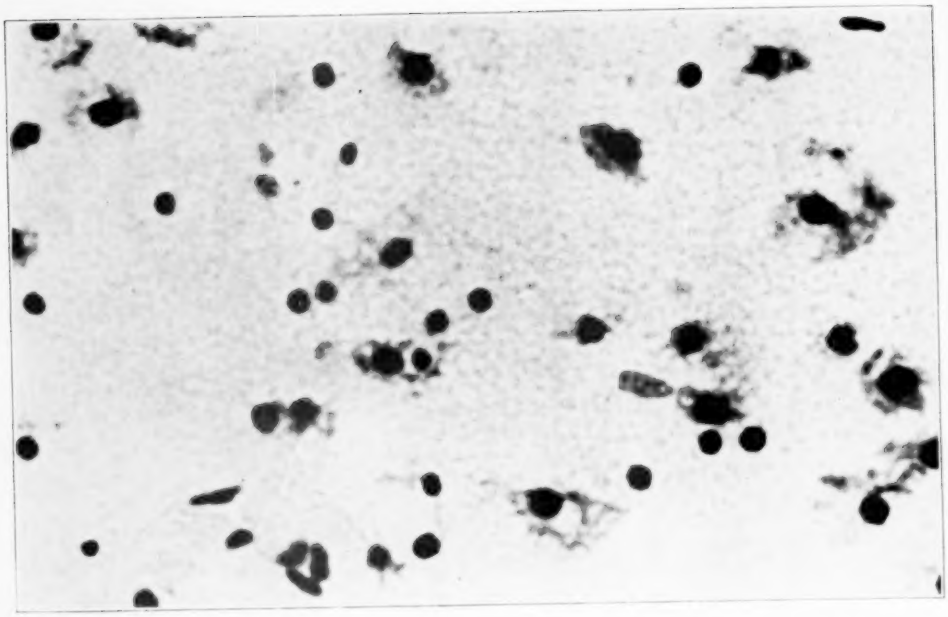

Fig. 21. Ischemic type of lesion of the nerve cells. Sheldon Dyar stain. Magnification 750

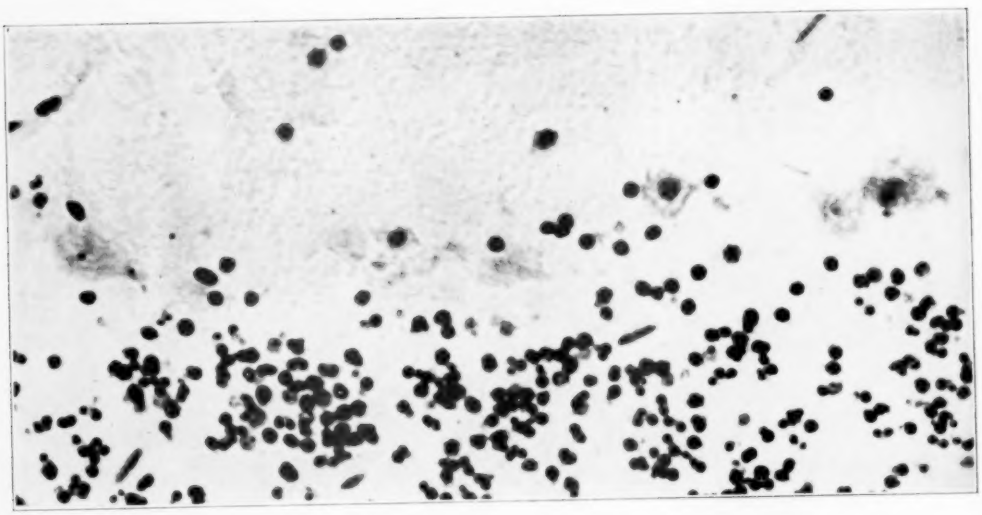

Fig. 22. Advanced disintegration of the Purkinje cells. Sheldon Dyar stain. Magnification 500

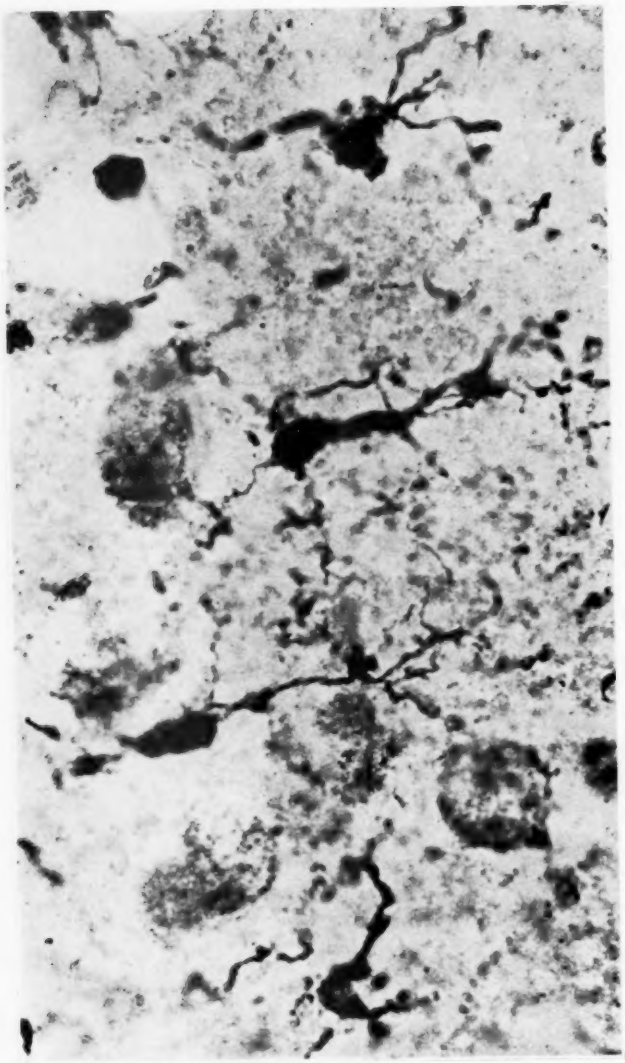

Fig. 23. Microglia reaction in the globus pallidus and Del Rio Hortega silver carbonate method. Magnification 750

RABBIT 11. Twenty-seven gassings in 44 days. At this stage the meninges show even more pronounced inflammatory changes. Besides the exudate surrounding the blood vessels a certain amount of free exudate is found in both meninges and brain parenchyma. In this case also, the changes are more pronounced in the region of the Ammon's horn where the inflammatory reaction is quite striking. As in the meninges, so also in the Ammon's horn, free inflammatory cells, i. e., lymphocytes and plasma cells are encountered especially in the region between the Ammon's horn and the fascia dentata. There seems to be a certain relationship between the degree of the cellularity of the region and the inflammatory reaction. The areas of softening seem to predilect the rhinencephalon, the area parietalis and the area occipitalis and temporalis. The caudate nucleus, the pallidus, the lateral portion of the thalamus, the corpus quadrigeminum anterior, the substantia nigra, the formatio reticulata of the pons and the cerebellum are the seat of softenings accompanied by inflammatory changes. Histologically, the stage of the softenings seems to be quite advanced in this case as a larger number of gitter cells is detected, most of which are loaded with fat products while microglia and oligodendroglia are undergoing advanced degenerative processes. In the exudate surrounding the softenings lymphocytes as well as plasma cells are quite numerous.

The type of lesion involving the nerve cell is usually the one of swelling and gradual liquefaction although in some regions including the Ammon's horn, lesions of the ischemic type are also detected (Fig. 21). The Purkinje cells also undergo a gradual disintegration through the same processes which lead here and there to a total disappearance of these elements. (Fig. 22.) In the medulla oblongata the sensory nucleus of the trigeminus, the tuber acusticus and the nuclei of the Deiters and Bechterew disclose many degenerative changes of the nerve cells. In the area of the supposed diencephalic vegetative centers, involvement of the nerve cells of the infundibulum of the paraventricular region of the ganglion supraopticus and of the corpus of Luys are a common finding.

The neuroglia reaction is very intense in the involved areas and in the Ammon's horn it even establishes a definite marginal gliosis. Degenerative changes of the neuroglia are often encountered in the periventricular areas especially surrounding the third ventricle. The microglia reaction is also diffuse in the globus pallidus (Fig. 23) and in the area temporalis and insularis in the Ammon's horn and of course wherever softening occurs. Spielmeyer's method for myelin sheaths discloses the diffuse swelling and breaking up of the myelin, especially in the rhinencephalon, regio innominata and internal capsule. The nerve fibers are correspondingly involved but appear to be more damaged in the fimbria and along the fornix. In the

spinal cord both inflammatory and degenerative changes are located in the meninges and in the grey matter.

RABBIT 12. Twenty-seven gassings in 54 days. The animal was sacrificed under the last gassing. The meninges are very congested and moderately inflamed. The infiltrative cells are either surrounding the blood vessels, or free in the connective tissue meshes. The same inflammatory changes are found all over the cortex and brain stem but their intensity is not so pronounced as in the previous case. The brain parenchyma appears markedly loose, especially in the subependymal regions, in the internal capsule and in the ventricular aspect of the Ammon's horn. In the brain cortex the lesions of the nerve cells appear the most localized in the second and third layer and seem to be more diffuse in the rhinencephalon and in the area insularis. In the diencephalon, the infundibulum and the rest of the hypothalamus are more severely affected. The nucleus habenulae and the corpus mammillaris show diffuse lesions of their cells while in the metathalamus both the corpus geniculatum laterale and medialis are involved (Fig. 24). In the mesencephalon the corpus quadrigeminum anterior, the corpus of Luys and the lateral portion of the substantia nigra are affected while the red nucleus as always, appears free from lesions. The pontine nuclei are the seat of diffuse cellular changes, especially marked in the lateral portion. Areas of softening are found in the cortex and in the brain stem but not in the basal ganglia. Surrounding the softenings the perivascular infiltration seems to be somewhat more pronounced although the inflammatory reaction may be present independently from the softening. The blood vessels of the cortex and markedly the very small ones, appear swollen in their lining endothelium and here and there endarteritic changes are also detected. No definite thrombosis has ever been encountered with the exception of the previously mentioned fat material in the lumen of the blood vessels which might be interpreted as fat emboli. In the ectomesodermic barrier, the lesions of the lining epithelium seem to be somewhat more pronounced and especially located in the region of the anterior horn of the lateral ventricle. There a sort of subependymal edema is noticeable and characterized by the accumulation of whitish material which occasionally stains metachromatically with the aniline blue stains and with the hematoxylin eosin (Fig. 25). Some grape-like areas of disintegration are also encountered in these vicinities as well as in the region of the basal ganglia and internal capsule. There is not much to add in regard to the reaction of the neuroglia and microglia except that the activity differs only in quantity from the previous case, the reaction being here especially more marked in the infundibular and mesencephalic regions. The involvement of the myelin sheath and nerve fibers is quite pronounced although it is in the spinal roots that the changes are more severe.

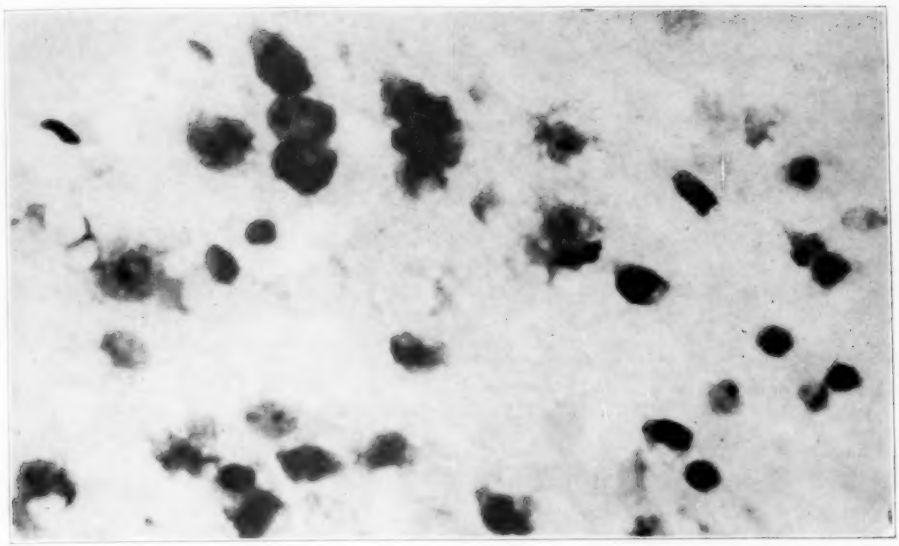

Fig. 24. Pronounced liquefaction (Verflüssigung) of nerve cells in the corpus geniculatum mediale. Sheldon Dyar stain. Magnification 1000

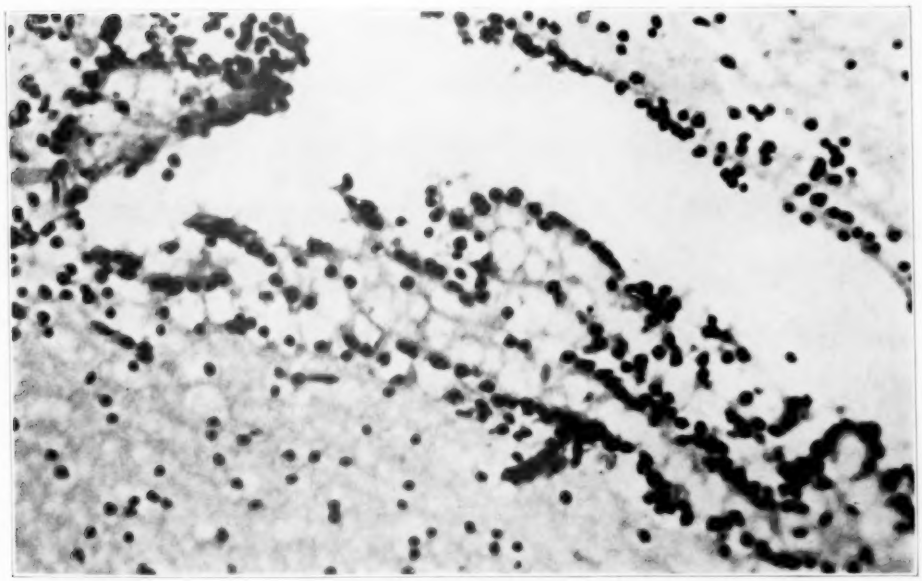

Fig. 25. Sub-ependymal edema. Presence of metachromatic substance. H and E stain. Magnification 375

Fig. 26. Acute degenerative changes (liquefaction) of the anterior horn cells. Sheldon Dyar stain. Magnification 500

Inflammatory changes, degenerative changes of the nerve cells and diffuse marked neuroglia reaction characterize the involvement of the spinal cord.

RABBIT 13. Forty gassings in 96 days. Animal died a few days after the last gassing. The meninges which are thickened over the convexity are the seat of intense inflammatory exudate formed by both lymphocytes and plasma cells and is more pronounced in the fissura rhinica over the pre and post-central areas, the temporal area and calcarine area. The involvement of the nerve cells is marked over the temporal and occipital areas especially in the second and third layer of the cortex. The putamen and the globus pallidus disclose the presence of perivascular exudate which is also present in the claustrum and in the capsula externa. A small area of softening is found in the right putamen. In the rhinocephalon and Ammon's horn, besides the acute degenerative changes of vacuolar type, ischemic lesions are found as well as shrinkage of the nerve cells of the so-called chronic type in which the cell appears shrunken, deeply stained and with markedly tortuous prolongments. The shrunken cells are especially numerous in the area retrosplenialis and in the anterior and posterior colliculus. The cortical blood vessels disclose the same amount of swelling as previously recorded and in the area temporalis and occipitalis there is, besides, a certain amount of endarteritis. It must be said, however, that in these regions no softening was disclosed although the nerve cells were diffusely affected. The paraventricular region, the infundibulum and the nucleus supraopticus are as usual severely affected and so are the ganglion habenulae, the nucleus anterior thalami and the corpus mamillaris. The corpus geniculatum laterale is only slightly affected while no marked lesions are located in the corpus subthalamicum nor in the substantia nigra. The corpus geniculatum mediale on the other hand, is the seat of a rather severe degenerative process accompanied by small areas of softening. Similar areas are scattered in the cortex, in the pons, and cerebellum. The Purkinje cells are markedly affected and many of them have disappeared generally through the process of liquefaction. A certain amount of conglutination of the granular layer is also noticeable. In the spinal cord a few nerve cells located in the anterior horn are undergoing degeneration (Fig. 26) but no areas of softening have been encountered. Grape-like areas of disintegration are quite often seen, some of them containing oligodendroglia nuclei and some others entirely free from nuclei. The neuroglia reaction is a severe one over the most affected region and many glia nodules are found here and there. It is in the Ammon's horn, however, that the neuroglia reaction is the most diffuse, especially in the Sommer sector where numerous nerve cells have entirely degenerated. In the caudate nucleus there is also a quite marked gliosis although changes of the degenerative type are seen especially

located in the sub-ependymal portion of this ganglion. In the putamen Fig. 27 shows the intensity of the neuroglia reaction. The same acute degenerative changes of the neuroglia are found as in previous cases in the sub-ependymal layers of the third ventricle. No swelling of the micro- nor of the oligodendroglia is detected. The microglia reaction is of the same type as previously described in both the areas of softening and in the areas of nerve cell involvement. In the spinal cord inflammatory changes are quite marked in both meninges and spinal parenchyma and the posterior roots, especially show degenerated myelin sheaths and nerve fibers.

RABBIT 14. One hundred and twenty-four gassings in 150 days. Animal killed under gas action. The meninges appear quite thick but no hemorrhages are seen. A certain amount of congestion is detected in both meninges and brain tissue. In the meninges the inflammation is quite marked and diffuse toward the convexity as well as toward the lateral portion and the base. The large blood vessel of the meninges do not show particular degenerative changes but a few of them are surrounded by a pronounced collar of exudate. In the external layers of the cortex the blood vessels appear increased in amount. The capillaries and the small blood vessels show a certain amount of swelling of the endothelium and several of them are the seat of a definite endarteritic process. Only occasionally, surrounding the endarteritic blood vessel are areas of softening found. The lamination of the cortex is not disturbed although the second and third layers of the olfactory cortex of the insular area and of the temporal area are the seat of a diffuse shrinkage recalling much more the chronic type of nerve cell involvement. However, parallel to the chronic involvement diffuse acute changes of the swollen type are detectable and numerous cells undergo a vacuolar disintegration leading here and there to the formation of small acellular areas. The area subicularis, area presubicularis and the Ammon's horn mainly in the lamina pyramidalis show diffuse degenerative changes and pronounced inflammatory reaction (Fig. 28). Small areas of softening are found in various serial sections of this region. Nerve cell changes are also detected in the basal ganglia, that is, the thalamus, caudate, putamen and pallidus. In the thalamus the paleo-thalamus is the most involved portion. the degeneration involving especially the medial nucleus and the nucleus habenulae. In the neothalamus two small areas of softening are found. In the lenticular nucleus small areas of softening are respectively located in the putamen and in the globus pallidus. The infundibulum discloses also a small softening while the nerve cells of the paraventricular region of the region of the tuber cinereum and of the ganglion supraopticus are severely damaged. In the substantia nigra the lateral portion discloses diffuse degen-

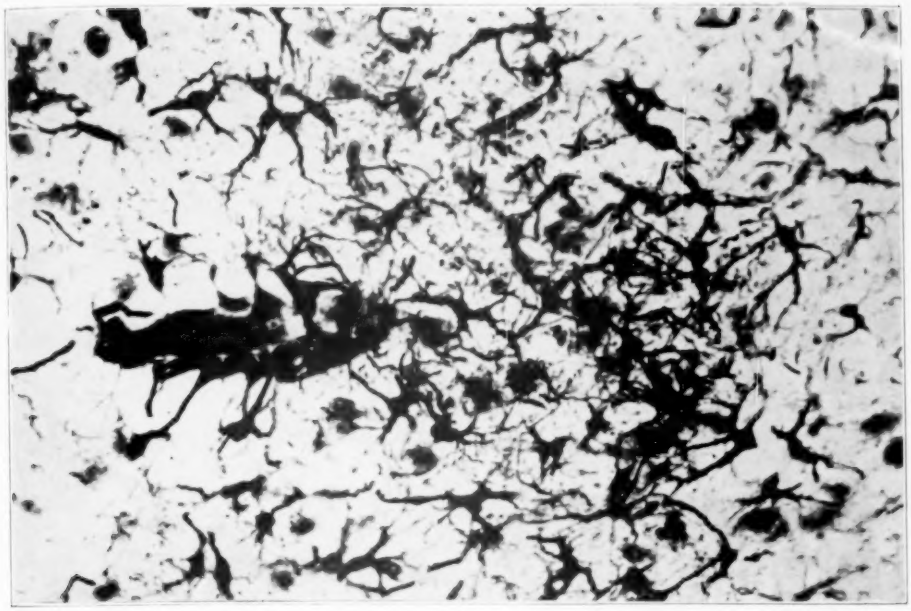

Fig. 27. Marked gliosis in the right putamen. Cajal gold sublimate. Magnification 250

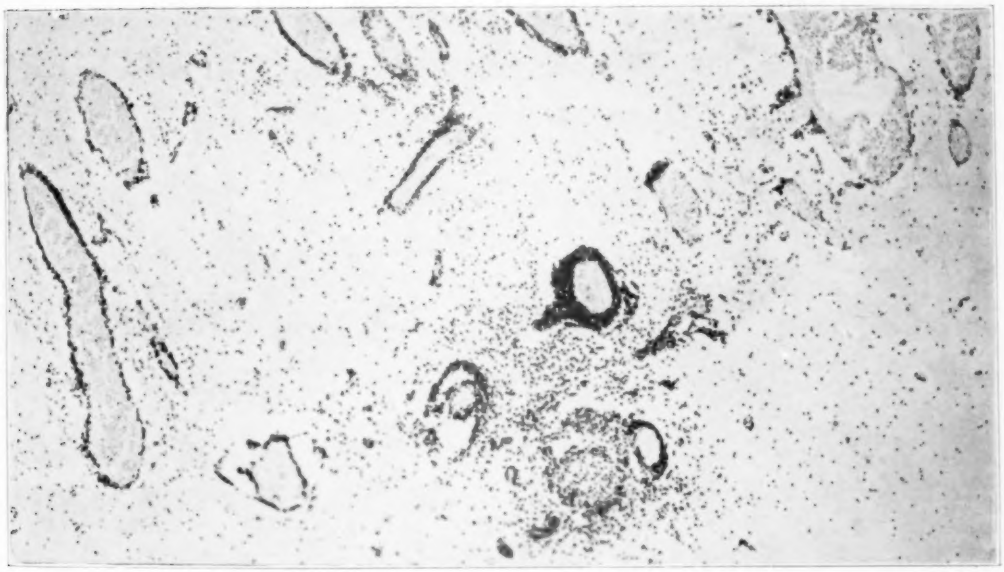

Fig. 28. Pronounced inflammatory reaction in the Ammon's horn. H and E stain. Magnification 60

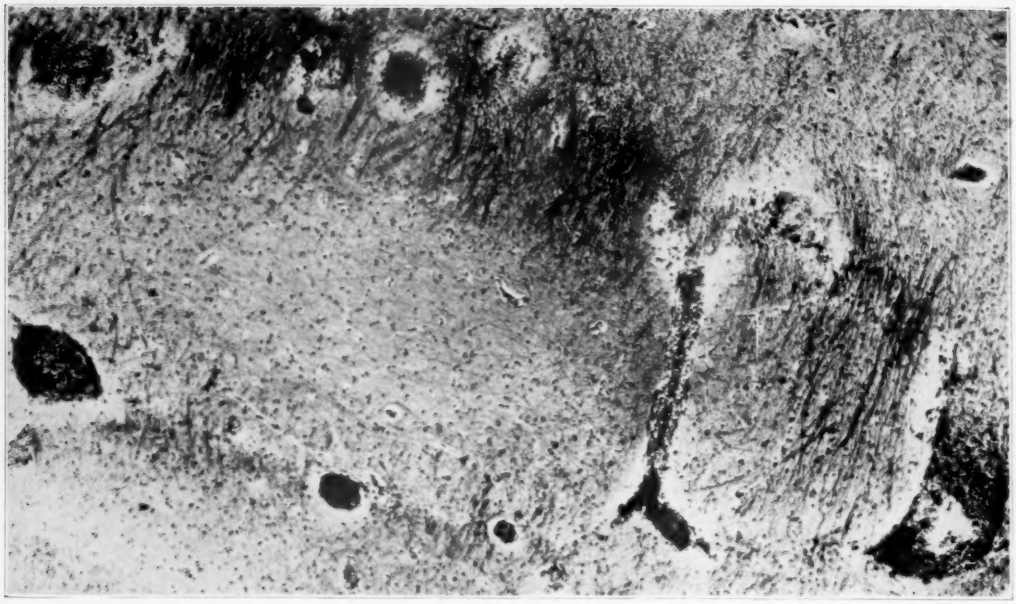

Fig. 29. Waste product of disintegration in the blood vessel sheaths and free in the surrounding tissue. Scharlack R stain. Magnification 65

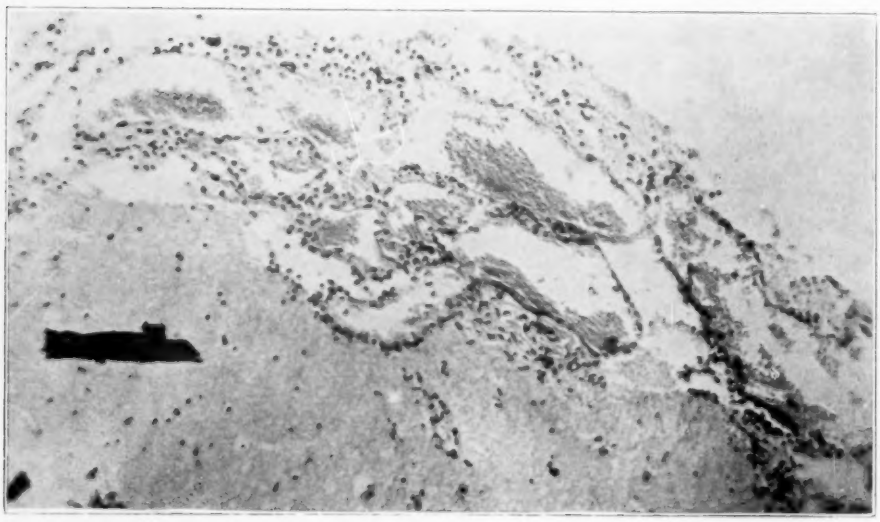

Fig. 30. Inflammatory meningeal reaction. Sheldon Dyar stain. Magnification 125

erative changes of the large elongated cells characteristic of the external lateral group. In the metathalamus (corpus geniculatum laterale and medialis) the cells are diffusely swollen undergoing an advanced process of disintegration. In the superior colliculus the external layers of cells appear shrunken with tortuous prolongments. In the pons the pontine nuclei are damaged and the region is the seat of bilateral softening. The cerebellum is severely affected in the layer of the Purkinje cells which are considerably diminished in number due to a gradual process of liquefaction. Some of the elements are, however, shrunken and poorly stained, thus recalling much more the type of the ischemic lesion. In the medulla oblongata the dorsal vagus, the vestibular and the motor trigeminal nuclei contain several degenerated cells. In the spinal cord the involvement of the anterior horn and the anterior and posterior roots is well pronounced.

The neuroglia reaction is very marked all over the nervous system and dominates in the most severely affected areas where hypertrophic and hyperplasic changes of the astrocytes are very definite. In the infundibular region, in the lenticular nucleus, and in the Ammon's horn the neuroglia reaction is the most pronounced, the cells disclosing for the most, proliferative changes. Regressive and degenerative changes are conversely found in the paraventricular portion in the cortex, in the diencephalon, and in the mesencephalon. Inflammatory changes are scattered throughout the cortex and in the brain stem. The exudate is formed by both lymphocytes and plasma cells. Nothing in particular need be said in regard to the areas of softening. The fatty products of degeneration are found in the meninges free or embedded in scavenger cells. Numerous scavenger cells are also found in the areas of necrosis where, however, free fat substance is also found in the perivascular sheaths. In the Ammon horn the fat material is abundant and heavily stained (Fig. 29). In the internal capsule the tissue has a cribroid appearance, that is, disseminated with holes in which a whitish refractive substance is located. Among the holes, small grape-like areas of disintegration are seen.

Rabbit 15. One hundred and thirty-nine gassings in 160 days. The histological lesions do not substantially vary from the ones described in rabbit 14. Here also the meninges are thick and are the seat of marked inflammatory changes (Fig. 30). Here also the nerve cell changes are scattered all through the cortex but dominantly in the olfactory area and in the Ammon's horn. As quoted in previous cases the internal portion of the thalamus and the various nuclei of the hypothalamus (supposed vegetative centers) are severely affected. The corpus striatum shows both cellular changes, that is, acute degenerative changes of the nerve cells and presence of small areas of softening located in the head of the caudate nucleus, in the putamen and in

the globus pallidus. No symmetry has been noticed with the opposite side although no serial sections of the opposite side have been made. The mesencephalon and the rhombencephalon are the seat of the same changes, as previously described. In the cerebellum the areas of softening are more numerous than in the previous stages but the lesions of the Purkinje cells closely resemble in intensity and extension the lesions of rabbit 14. In this case also, besides the acute swelling and the ischemic type of lesion, the nerve cells of some cortical areas and of the superior and inferior colliculi show chronic changes of the shrinkage type with certain amount of ameboid reaction of the neuroglia. In the spinal cord the white substance appears somewhat loose in texture and the cells of both anterior and posterior horns are diminished in number. Some free capillary hemorrhages are found in the gray substance. The posterior roots show swollen nerve fibres surrounded by swollen myelin sheaths which here and there are segmented and tend to disintegrate. There is nothing special to be said in regard to the neuroglia and microglia. The fat products of disintegration are found scattered in the areas of the lesions but are also present in the meninges which participate in the *Abbau* process (Fig. 31).

The ependymal lining cells are markedly degenerated and the subependymal layer is the seat of both proliferative and degenerative changes of the neuroglia and microglia. The choroid plexi show a severely affected epithelium markedly disintegrated (Fig. 32) and very poorly stained.

Comments

As we have mentioned in our case reports, in the early stages following illuminating gas poisoning only degenerative changes of the nerve cells accompanied by the usual neuroglia reaction are seen. It is only in further advanced stages that areas of softening appear and in still more advanced stages inflammatory changes are detected. The type of lesion seems then to be parallel with the intensity and duration of the gas action. It must be remembered, however, that our material is an experimental one and dealing with only one type of animal, thus rendering the comparison with pathology in other animal experiments or with the human pathology somewhat relative.

We also wish to emphasize that the histological changes which we have found in the nerve cells may be classified into three groups: (a) changes of the ischemic type in which the nerve cell appears shrunken but very poorly stained with a distorted nucleus and tortuous prolongments; (b) changes of the swollen type in which the cell body appears enlarged, poorly stained, the nucleus swollen and the cytoplasm vacuolated leading to the disintegration of the nerve elements through a process recalling the "Verflüssigung" of

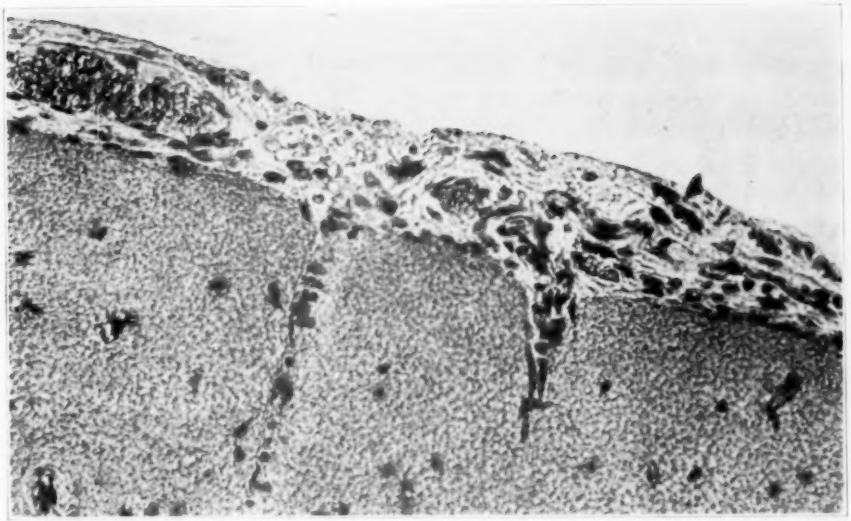

Fig. 31. Thickened meninges and meningeal Abbau process. Oil soluble red stain. Magnification 250

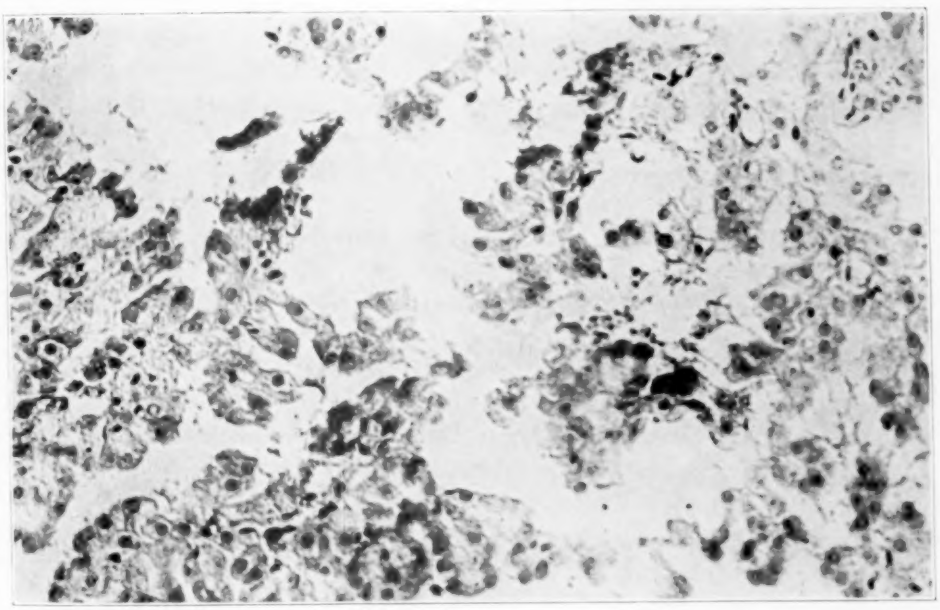

Fig. 32. Pronounced degenerative changes of the choroid plexus. H and E stain. Magnification 250

the German authors. However, the latter two processes are analogous only in their ultimate stage, for in the acute swelling there is a lack of ameboid reaction of the neuroglia elements such as is commonly associated with original *Verflüssigung,* changes of the chronic type which consists in shrinkage of the cell body, shrinkage of the nucleus, and tortuosity of the prolongments, while the whole cell appears deeply stained. This type of lesion has been encountered in the rather advanced stages but we must mention the fact that even in early stages we have been able to detect this peculiar type of shrinkage, thus upholding the view of those (Nissl, Spielmeyer[47]) who believe that the denomination of chronic lesion is rather inappropriate, this type of change being occasionally found also in acute pathological conditions.

According to our conception, each of the types of lesions, but mainly the acute swelling and the ischemic type, may correspond to a different mechanism of production. As we will see in the further discussion, the pathogenesis of the lesions following gas poisoning is a complicated one and many factors enter into action more or less simultaneously. We feel for instance that while the ischemic type of lesion may be connected with the vascular involvement, mostly functional, the swelling of the nerve cells may be more closely related to the venous stasis, increased intracranial pressure and increase in the brain volume.

In regard to the presence of inflammatory changes we have already mentioned in the first part of this paper that some authors have considered the whole process as an inflammatory process of encephalitic type. This view does not seem correct to us as in the early stages notwithstanding diffuse degenerative changes, no trace of inflammation is present. It is only in a later period that the exudate appears. The infiltrative cells which we have detected in the meninges or in the cortex either free or surrounding the blood vessels are represented by both lymphocytes and plasma cells. Only occasionally in the most severely affected areas has an increase in the number of the blood vessels also been noticed while in the majority of instances such an hyperplasia was absent.

What is the interpretation of these inflammatory changes? The answer seems a difficult one although we feel inclined to consider this inflammatory reaction as belonging to the so-called symptomatic type (Aschoff, Spielmeyer[47]) which type has been reported in purely degenerative processes. It may represent the expression of a toxic irritation leading to the breaking down of nervous tissue and an attempt of the organism to get rid of the disintegrated waste products. Another possibility which, however, is not substantiated by the pathological picture is that we may be dealing with an intercurrent infection in a general "rundown" condition following repeated prolonged gassing.

The areas of softening occur only in advanced stages, that is, after almost ten repeated gassings. The absence of softening following a few gassings seems to us important as it establishes undoubtedly a relationship between the severity of the gassing and the appearance of such changes. That the number of gassings is an important factor is proved by the fact that in some rabbits which have been gassed a few times and which have lived for a few weeks following the last gassing no softening was detected whatsoever. The factor of time therefore has relatively less importance than the number of gassings.

The pathogenesis of the areas of softening involves a wide discussion over the pathogenesis of the whole pathological process. The first natural tendency would be the one considering a specific action of the carbon monoxide contained in the illuminating gas on the nervous tissue. This special point has been recently emphasized by Ruge who believes that among other factors there might be a specific action of the gas on the nerve cells. Dealing with illuminating gas in which various elements are present it may be very difficult to state which is the one responsible for such an elective action on the nervous tissue. We must, however, recall that among the experimenters, Haggard does not believe in a noxious action of carbon monoxide upon the nerve cells as he has been able to keep isolated cells apparently thriving in an atmosphere of 79 per cent of carbon monoxide. This author found, however, that illuminating gas killed very quickly any nerve cell with which it came in contact. It may very well be that much of the harmful action of illuminating gas on nerve cells is due to the presence in the gas of ethylene which Mathews found to be much more toxic than CO to many plants. Haldane[48] and his coworkers have assumed that CO which has an affinity for hemoglobin 220 times as great as that of O2 (Nicleoux) unites with Hb and that it owes its toxic effect to the interference with the oxygen carrying power of the blood. Mathews is inclined to doubt this and suggests that CO may unite with other oxygen receptors than HB and in this way may directly act on the cell. In support of this view he mentions the fact that CO is also toxic towards some animals and plants that do not possess HB. At any rate we cannot divest ourselves from the impression that a certain amount of direct injurious action on the nerve cells may occur as the result of a certain affinity of the gas for the nervous tissue.

Besides this supposed specific action, the pathogenesis of the lesion occurring in illuminating gas poisoning may be explained on the basis that true vascular changes do take place. We must, however, distinguish between the acute and the chronic stages. In the acute stages we have frequently reported a more or less diffuse swelling of the endothelium of the blood vessels, namely, of the small cortical ones. It is possible then, that such a swell-

ing reduces the lumen of the blood vessel, thus provoking nutritional changes of the nervous tissue. The swelling of the endothelium may itself be considered as a result of a combined direct toxic action of the carboxyhemoglobin as well as of the increased intracranial pressure. In the chronic stages besides the occurrence of a certain amount of swelling which may be connected with the last gassing under which the animal is sacrificed we have reported true endarteritic changes of the proliferative type. We must, however, emphasize the fact that such proliferative changes are not considerable and that occlusion of some of the small blood vessels cannot account alone for the presence of diffuse areas of softening. As a matter of fact in the so-called endarteritis of the small blood vessel (Nissl-Alzheimer) of luetic origin although diffuse endarteritic processes are found throughout the various cortical areas we seldom encounter areas of softening.

Besides true anatomical changes of the blood vessel recent investigators have suggested the occurrence of functional changes in the calibre of arteries and veins which changes are primarily responsible factors for pathological lesions. As a fact Spielmeyer, Hiller, Weimann, Grinker and others claim that following carbon monoxide poisoning a vasoparalysis follows demonstrable under the form of vasodilatation the result of which is a deficient nutrition of the nervous elements. The nerve cell changes are interpreted by them as belonging to the ischemic type. We did find such a vasodilatation in most of our rabbits which have been sacrificed under the gas action while this change was absent when the animals were killed at different intervals of time following the last gassing. How the vasomotor changes occur is still a speculative question. We have not as yet satisfactory evidence of the existence of a vasomotor control of the cerebral blood vessels. An attempt to explain may be founded on the basis that the skull has to be considered as a closed box (Weed and Hughson) and that assuming the lack of vasomotor supply the arterial pressure within the skull must depend upon the degree of vasoconstriction outside the cranial cavity which mechanism is under the control of the medullary centers. Now for the carrying out of the medulla and brain's normal function a certain blood pressure is necessary and this is directly dependent upon the pressure in the carotid arteries and circle of Willis. The inhalation of illuminating gas gives rise to an oxygen want and with this increased venosity of the blood a greater hydrogen ion concentration acts on the medullary centers, thus producing among other things a vasoconstriction in the extracranial part of the body. Because of the constricted calibre of these vessels, peripheral, splanchic, etc., there is a greater passive pressure in the carotids and in the skull. The venous stasis in the brain tissue is then accompanied by an increased intracranial pressure which renders the mechanism of production of the lesion a

more complicated one. In fact while following venous stasis, nutritional changes may occur, the increased intracranial pressure may itself be another cause of disturbed nutrition as well as of a mechanical disturbance for the nervous elements.

The increased intracranial pressure following carbon monoxide poisoning has been recorded by Cobb, Forbes and Fremont-Smith, who found in their experiments two distinct elevations of pressure, one due to increased arterial pressure and a second one to the resulting cerebral edema. The investigation of Cobb, et al., substantiates from the experimental point of view the conception of vasomotor disturbances occurring under the action of the gas poisoning. It must be pointed out, however, that besides the pure vasomotor disturbances another factor enters into action, that is, the increased intracranial pressure due to cerebral edema and also recorded in the experiments of the previous authors. An investigation was indeed carried out by them, in order to elucidate the physiological mechanism causing the peculiar headache which people exposed to carbon monoxide suffer from. In their inquiry the first question, according to them, was whether or not carbon monoxide causes an increased intracranial pressure. They have been able to observe during the experimental gassing a marked rise in cerebro-spinal fluid pressure shortly after the animal began breathing the carbon monoxide. The abruptness of the rise and the shape of the curve depended on the strength of the carbon monoxide mixture and on the condition of the animal. The pressure ran from an initial one of 60 to a maximum of 165. The increase in the intracranial pressure has been considered by the investigators as a result of cerebral congestion, controlled by ophthalmoscopic investigation, and of cerebral edema. No actual increase in the amount of cerebro-spinal fluid was reported.

The occurrence of cerebral edema which Lewin had already reported in his monograph was confirmed by Cobb, et. al, who, following trephining of the skull, were able to detect a more or less pronounced bulging of the brain into or above the trephined opening. Some of the animals showed marked increase in brain bulk and one dog in particular developed a very striking cerebral hernia. It is worthy to note that the most marked bulging of the brain did not occur during the actual gassing but took place in the period of recovery or postasphyxial period. The brain bulk was diminished following intravenous injection of hypertonic solutions. Histologically, in three out of six animals the choroid plexi disclosed swelling, irregularity in outlines and occasionally loss of nuclei.

This investigation is, we feel, of great importance, and may explain some of the histological changes occurring in illuminating gas poisoning. Weed and McKibben,[49 50] in fact, have reported histological changes of the brain

tissue following intravenous injections of hypotonic solutions, which leads to an increased intracranial pressure with bulging of the brain parenchyma into the trephine opening as in Cobb's experiments. That is why we feel justified that in our cases some of the pathological changes may be the result of repeated increase in intracranial pressure occurring at the time of every repeated gassing. In connection with this particular point we have started a special investigation as to the occurrence of minute histological lesions following repeated intravenous injection of hypotonic solution with a special consideration of the occurrence of areas of softening and to the reaction of neuroglia and microglia. Without anticipating any definite statement, we may say that some of the lesions closely resemble those following gas poisoning.

In all our animals following the initial period of gassing, convulsive seizures occurred. This fact connected with the other one of the cellular lesions of the ischemic type reported in our histological studies, seems to uphold Spielmeyer's conception that convulsive seizures may be the result of functional vascular changes resulting in ischemic changes of the brain, mostly located in the Ammon's horn and in the cerebellum. Such a functional vasoconstriction must take place in the early period of the gassing before venous stasis occurs (preparoxysmal vasoconstriction).

Is the pathological process following illuminating gas poisoning elective for certain parts of the nervous system? It has been assumed that such an electivity does exist for the striatum, especially for the globus pallidus. This seat of election has been connected with the peculiarity of the blood supply of the region, i. e., the anatomical conformation of the blood vessels which at this level branch at right angles from the middle cerebral artery (Kolisko-Goldstein). This explanation, however, does not apply to the Ammon's horn where other factors as a poor capillary supply, seem to account for the predilection. (Uchimura.) The electivity of the process in human pathology has been only in part confirmed by the experimental investigations. As a matter of fact, in 1920 Lewin reported that focal lesions were not disclosed in gassed animals but the following year Photakis described the occurrence of diffuse hyperemia and hemorrhages in the basal ganglia. In chronic stages these authors reported the presence of symmetric softenings of this region with, however, no definite specification as to their localization in the caudate, putamen or pallidus. Very recently A. Meyer has reported the results of experimental work on cats and has stated that there was an election of the process for the globus pallidus. In only one case out of nine Meyer was able to detect lesions of the Ammon's horn, while the cerebellum is reported as being always unaffected. Meyer's findings do not agree with ours although it must be said that in Meyer's cases the

gassing has never been so prolonged as in most of our cases. On the other hand, the difference in the technique may account for the variety of the results. Indeed in our cases we have used oxygen and illuminating gas simultaneously which fact led to a higher saturation of CO in the blood. We consider this point important and presumably enough to account for the different results.

In our cases as reported in detail, we have been unable to detect any particular affinity of the gas for the region of the striatum. The lesions of the nerve cells and the occurrence of areas of softening in this nucleus are not greater than the cell changes and the frequency of softening in other parts of the brain. If any electivity may be mentioned in our material, it is an electivity for the Ammon's horn where marked congestion, degeneration of cells, gliosis and softening have been constant findings.

We have also been struck by the fact that the olfactory centers seem to disclose the most severe changes. Both the primary and secondary centers are affected and such an electivity is noticeable even in early stages. The anterior and posterior olfactory lobe, the Ammon's horn, the ganglion habenulae and the corpus mamillaris are locations where the process is the most severe. The ganglion habenulae and the corpus mamillaris are definitely the seat of severe changes of both nerve and neuroglia cells while areas of softening are very rarely encountered. This electivity of the process for the olfactory system may be related to the way of introduction of the gas through the respiratory and olfactory pathways. This explanation is, however, a very vague one since we know that the olfactory system does not consist of a unique set of neurones but of numerous interassociated tracts connecting the peripheral apparatus to the primary and secondary centers and to other more distal structures.

Finally another region where the lesions appear to be constant and severe, is the hypothalamus where the various nuclei are the seats of pronounced cellular changes. Among these the paraventricular nucleus, the nuclei of the tuber cinereum and the ganglion supraopticus are constantly affected. On the other hand lesions in the corpus of Luys and the substantia nigra have quite often been reported. If we consider that this region is supposed to be the location of the vegetative centers, controlling some of the most important metabolic functions, (fat, sugar and water metabolism), the suspicion arises in our mind of connections which may exist between the involvement of these nuclei, the loss of weight and the general run-down conditions which the gassed animals frequently present.

Conclusions

1. Experimental illuminating gas poisoning in rabbits is followed by diffuse nerve cell changes throughout the cortex, the brain stem, the cerebellum and the spinal cord.

2. In the early stages the lesions are mainly degenerative in type involving the nerve cells, which show acute swelling, liquefaction, lesions of the ischemic as well as of the shrinkage type. Neuroglia reaction accompanies these changes and the microglia and oligodendroglia undergo a process of acute swelling.

3. In a later period the process is a combined degenerative and inflammatory one. Areas of softening are also seen quite numerously and microglia reaction leading to the formation of gitter cells is plainly visible. The inflammatory changes presumably belong to the so-called symptomatic type.

4. In acute stages the endothelium of the blood vessels is swollen while in chronic stages a true endarteritic process may be found.

5. The degenerative lesions have no predilection for the striatum as is the case in human pathology but are evenly distributed in the various cortical and central areas.

6. The olfactory system (primary and secondary centers) is very early affected and among other structures the ganglion habenulae and the corpus mammillaris are particularly damaged.

7. Besides the olfactory system the infundibular and hypothalamic structures are seriously involved, the lesions affecting especially some of the supposed vegetative nervous ganglia.

8. The peripheral nervous system is also involved as shown by the lesions of the anterior horn cells of the spinal cord, and of both posterior and anterior roots.

9. The pathogenesis of the lesions is a complex one since besides the functional vascular changes, true anatomical changes occur. A direct noxious action of the gas on the nervous tissue through the eventual chemical changes of the blood must not be disregarded, and finally a mechanical factor may enter into action as a result of an increased intracranial pressure.

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SOME OBSERVATIONS ON THE INTELLIGENCE QUOTIENT IN EPILEPTICS

A PRELIMINARY REPORT

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The earliest successful intelligence tests were devised by Alfred Binet in the opening years of this century and are called by his name, although various revisions of the original Binet scale have been produced. To pick out those children in the Paris schools whose general mental development was so delayed as to necessitate their being placed in special schools, he devised the plan of confronting them with a series of simple miscellaneous tasks of graded difficulty. By long experience he found which tasks were within the power of the average 6-year-old, the average 7-year-old and so on. These tasks included recognizing and naming simple objects, stating similarities and differences between things, performing three simple commissions given simultaneously, pointing out absurdities in certain statements or omissions in pictures, rearranging disarranged sentences, telling the proper action in given emergencies and the like. The Stanford Revision by Herman, the most widely used American adaptation of the Binet method, provides 6 tests for each year from 3 to 10, 8 tests for year 12, 6 for year 14, 6 for "average adult" and 6 for "superior adult" intelligence.

Now in the language of the Binet scale, the person who can pass the tests equivalent to normal 8-year-old performance is said to have a mental age of 8. The quotient obtained by dividing this mental age by the individual's chronological age is known as the intelligence quotient which is employed so frequently that it is customarily abbreviated to I. Q. If in the above example the child's actual age is 8, he is said to be of normal intelligence, and his intelligence quotient is 100. If, however, he is only 6, but with an 8-year-old intelligence, he is described variously as two years mentally advanced, of superior intelligence, bright, of an I. Q. of 120, etc. But, if on the other hand, he has attained this 8-year intelligence level only at 10 years of age, he is termed dull, retarded, of an I. Q. of 80 and so forth.

Terman, who has helped to adapt Binet's original French tests to American situations and who has extended the scale of the tests

up to the adult level, has championed the view that the relative standing of an individual in a group of his peers, secured at a time so early even as the period of school entrance, does not materially change with age, if other factors are constant. The concept that the intelligence quotient of an individual, if correctly determined, is a fairly definite and constant characteristic of his mental make-up; reflects the intellectual quality of his mind and is fairly constant for a given individual, while generally accepted, has been challenged in the literature from time to time during the last twenty years. In fact the 27th (and most recent) Year Book of the National Society for the Study of Education presents evidence which suggests that the I. Q. may change at least in some so-called normal individuals, so that while the proposition that the I. Q. remains constant is generally true it cannot be held too rigidly as a dogma.

With dull, retarded and defective classes, the constancy of the I. Q. seems even more questionable and the literature contains accounts which are not entirely in accord with one another. Dovrak in a survey of retarded and defective children in St. Paul, has gone to some length to show that the probability is very high that the intelligence quotient of a subnormal child, if taken accurately will decrease rather than increase while the converse would be true for those with an I. Q. over 100. Berry in examining 390 pupils in special classes by means of the Stanford Binet at varying intervals from 11 to 35 mo. came to the conclusion that an I. Q. from 50 to 69 remains constant but that an I. Q. between 89 and 100 is likely to decrease with age. On the other hand, Poule, in connection with her work on Randall's Island, reports that the curves of 126 inmates of the children's hospital do not differ from those worked out by Terman from unselected school children and claims that mental defectives show no more variability in their I. Q. than do normal subjects. A survey of the literature thus leaves the matter still an open question, although decline with progressive deterioration may be anticipated.

The only record of any previous observations on the I. Q. in epilepsy which we were able to find in the literature to which we had access was the article by Richmond in which she records her observations on seven "carefully selected" cases which she studied at the Wyoming training school for a period of several months by

means of the Stanford-Binet and the Kent-Rosanoff free association tests. These cases showed a rather wide range in their mental state varying from instances of slight or practically no deterioration to those in which the deterioration was advanced. She found that with the Stanford Binet, the outstanding features were disorder of attention and poor motor coordination in drawings. Interest seemed to be subordinated to desire for approval and the examiners own interest in the subject. Richmond believes that the free association test is the best measure of the epileptics mental condition (and I might add parenthetically that in a study in free association which has been in progress here for quite a long time we also find the results rather promising) and concludes that the mental condition as shown by test bears no essential relation to the frequency or severity of the seizures. The objection might be urged that the number of cases are too few and the period of observation relatively short.

In view of the progressive deterioration often encountered in epilepsy, it occurred to us that a further study of the I. Q. in this condition might, perhaps, throw some light upon the rate or character of this deterioration, especially as Richmond has pointed out the absence of correlation between the mental condition as shown by tests and the frequency or severity of seizures. Consequently, a record of two or more I. Q.'s was obtained from a series of epileptic school children and carefully scrutinized for this purpose. These children were of both sexes and were selected only in that they were inmates of the Colony and attended the Colony school. Altogether 128 pupils were examined. Of this number 63 were boys and 65 were girls. They were tested by means of the Binet-Simon by Miss Kennedy, Mrs. Keith and Miss Fonner at intervals of a year or more, as follows: 98 epileptics were tested twice and 30 were tested three times. The former group included 51 boys and 47 girls; the latter 12 boys and 18 girls.

In interpreting the difference between the I. Q. secured at different times a deviation of 2 points in either direction from the original figure was attributed to possible experimental error and any subsequent result which approximated by two points or the less the original finding was regarded as showing no change in the I. Q. When the amount of the difference between the two quotients exceeded 2,

the result was interpreted as an increase or a decrease depending upon whether the subsequently derived I. Q. exceeded or fell short of the original figure. In those groups where three separate results were obtained, the first was compared with the second and the second was then compared with the third. In addition the first result was also compared directly with the third.

The 51 boys tested twice showed an age range of from 8 years 9 months to 17 years and 4 months at the time of the first test and an age range of 9 years 1 month to 18 years and 6 months at the time of the second test. The time interval elapsing between the two tests varied from 1 year and 4 months to 3 years and 7 months. The I. Q. ranged from 38 to 114 at the time of first examination and from 45 to 113 at that of the second. Of these individuals, 5 were normal or slightly above (I. Q. around 100); 9 were dull or retarded (I. Q. between 80 and 90), and 3 were definitely feebleminded, 33 being morons (I. Q. between 50 and 70), and 3 being imbeciles (I. Q. below 50 and above 25). In this group 13 boys showed no change in the I. Q. as previously defined, while upon retesting 20 showed a decrease with lapse of time and 18 showed an increase. The maximum loss was 17 points and maximum gain was 18 points.

In order to ascertain whether our results were in accord with the findings reported by Berry, the variations above and below an I. Q. of 80 were also determined and it was found that in those boys with an I. Q. originally above 80, 5 showed a decreased, 6 showed an increase and 4 showed no change while in those with an I. Q. below 80, 15 showed a decrease, 12 showed an increase and 9 showed no change. Since the number of individuals whose I. Q. falls below 80 in this group is slightly greater than double that whose I. Q. exceeds 80, the changes in both directions seems to proceed at about the same rate on both higher and lower levels and there is a definite and corresponding fluctuation in the I. Q. at both points. This holds also for the groups subsequently described.

The five boys whose I. Q.s were nearly normal afford an interesting illustration of the variations encountered in the I. Q. in epilepsy. Of these 5 individuals, 1 showed no change in I. Q.; 2 showed an increase; 1 of these has infrequent seizures, the other has frequent seizures and is receiving luminal. Of the 2 who showed decline, the seizures had become increased in both and neither received luminal.

The group of 12 boys who were tested 3 times showed an age variation of from 8 years and 2 months to 15 years and 3 months at the first testing, one of from 9 years and 2 months to 17 years and 4 months at the second testing and one of from 11 years and 11 months to 19 years and 4 months at the third testing. The interval between the first and second examination varied from 1 to 3 years and that between the 2nd and 3rd from 1 year 2 months to 2 years 9 months. The period elapsing between the first and last test varied from 3 years and 5 months to 5 years and 8 months. There were no normal individuals in this group but 4 were only retarded while 8 were definitely moronic. At the time of the second test 5 showed a decline in I. Q.; 5 an increase and 2 no change. Both of the instances without change and 3 of those showing either a decrease or an increase were found in individuals whose I. Q. was below 80. Of those with an I. Q. above 80, 2 boys showed an increase and an equal number showed a decrease. At the time of the third testing 4 showed a decline, 5 an increase and 3 no change. All 4 instances of decline, 3 of increase and 2 of no change were observed in boys whose I. Q. lay below 80, while two instances of increase and one of no change occurred in individuals with I. Q. score above 80.

The group of girls tested twice included 3 individuals with a normal I. Q.; 11 backward girls and 33 definitely feebleminded ones; 28 of whom were morons and 3 of whom were imbeciles. The I. Q. varied from 47 to 109 at the first examination and from 42 to 109 at the second. In age this group ranged from 5 to 19 years at the time of the first test and from 7 years 4 months to 21 years 4 months at the time of the second test with an intervening interval of from 1 year to 3 years 10 months. In this group 18 showed no change, 16 showed an increase and 13 a decrease in score. In this group 3 whose I. Q. declined, 5 whose I. Q. increased and 6 whose I. Q. did not change were originally above 80; the rest were below. The maximum gain was 26 points, the maximum loss was 9.

Of the three individuals having a normal mentality according to the test, two showed no change while one showed a decided drop although she has had no increase in the number of her seizures and receives luminal.

The group of girls tested 3 times consists of 2 individuals of apparently normal mentality, 2 backward girls and 14 feebleminded,

13 of whom were morons and 1 of whom was an imbecile. This group showed an age range of from 8 years 4 months to 14 years and 2 months at the time of the original test, one of 10 years 4 months to 18 years and 2 months at the next examination and one of 12 years 4 months to 18 years and 6 months at the time of the final test. A period of from 10 months to 2 years and 8 months elapsed between the first and second test, one of from 5 months to 3 years and 3 months between the second and third. The time elapsing between the initial and the final test varied from 1 year and 7 months to 4 years and 8 months. The I. Q. range during the first test was 48—102, during the second 46—106 and during the third 46—108. Between the first and second test 10 showed no change, 6 showed a decline and 2 an increase. Of these, 2 showing an increase and 1 each showing no change or a decline had an I. Q. above 80, the rest fell below this level. Upon contrasting the results of the second test with those of the third 6 showed no change, 8 dropped and 4 rose in score; 3 of the increased scores and also 3 of the decreased scores lay above the dividing line of 80, all others lay below.

Of the two individuals with a normal I. Q. one showed first an increase of 14 points and then a loss of 3 while the other showed a consistent gain of 3 points at each examination. Neither received luminal and both had rather light seizures which remained about the same in frequency and severity during the course of the testing.

In presenting our data the changes in cases with a normal I. Q. have been particularly emphasized since they are taken to represent epilepsy per se without the complicating factor of primary or secondary mental defect. Even when complicated by the presence of the latter, however, the peculiar character of the I. Q. in epilepsy manifests itself through the mask of the concomitant defect by the irregularity of its behavior. Not only is the I. Q. not constant but it varies in a rather unusual fashion, i. e., it sometimes declines and sometimes increases. Moreover the rise does not always correspond with a decrease in seizures or with the administration of luminal—although it may sometimes—nor does the fall necessarily appear with increase in seizures or without the administration of luminal. It may coincide with any of these factors but in the main it manifests its peculiarities independently of their influence.

Again, as has already been intimated, this variation in the I. Q. occurs at the higher as well as the lower intellectual levels tested in these people and does not confine itself to any particular segment of the mental scale. This irregularity of the I. Q. may raise a question in the minds of some whether the Binet-Simon test in its revised form could not advantageously be replaced by some other type of mental test in this condition—and possibly it could—but to us it seems clearly to show that both the rate and the extent of mental deterioration in epilepsy varies greatly from individual to individual so that no general formula can be attempted—at least not from the data at present available.

From the consideration herein presented, we feel justified in offering the following conclusions:

(1) The I. Q. varies considerably in the epileptic.

(2) This variation may involve either a rise or decline in score.

(3) This variation in the epileptic may occur at any mental level.

(4) The variation in the I. Q. seems in the main to be independent of seizure frequency or severity or of medication.

(5) The rate and extent of deterioration in epilepsy as determined by the I. Q. seems to show great individual variation.

(6) The subject of the I. Q. in epilepsy invites further investigation.

EXPECTATION OF MENTAL DISEASE

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Some years ago Dr. Thomas W. Salmon raised the question of the expectation of mental disease by asking what proportion of the population become patients in hospitals for mental disease in the course of a generation. He attempted to find an answer by comparing deaths in a single year in New York State in hospitals for mental disease with those in the general population. He found that in a given year 1-22 of the deaths reported to the New York State Health Department occurred in hospitals for mental patients. Comparing deaths in such hospitals with admissions, he found that the latter were approximately twice as great as the former. He concluded from these data that about one out of every ten or eleven persons became mentally ill in the course of a generation. The estimate was made from data drawn from several generations and proved much too high.

A preliminary combined mortality and mental disease table prepared at the time of Dr. Salmon's inquiry in the statistical bureau of the New York State Hospital Commission from crude data gave the proportion of those becoming mentally ill in the course of a generation as approximately 1 in 25.

The study herewith presented is an attempt to show more definitely the expectation of mental disease in New York State not only at birth but at every age of life. The life table method of analysis has been used and the data have been segregated by sex and nativity. So far as known this is the first attempt to produce standard, combined life and mental disease tables.

The data with respect to mental disease have been derived from individual statistical schedules of first admissions prepared in the State hospitals and licensed institutions for mental disease in New York State, and sent regularly to the statistical bureau of the Department of Mental Hygiene.

Cases of mental disease too mild to require admission to a hospital are not considered in this study.

In order to secure an adequate number of cases for detailed analysis the first admissions of 1919, 1920 and 1921 were taken,

comprising a total of 21,997 cases. These were subdivided as follows: native males, 6,362; native females, 5,697; foreign-born males, 5,373; foreign-born females, 4,565. Each nativity group was classified by age and sex and the average annual number of first admissions of each class was computed.

Corresponding data for the general population of the State of New York were taken from the U. S. Census of 1920 and were adjusted to read as of July 1, 1920. As is always to be expected in such data, there was great irregularity in the age distribution of the patients and of the general population and it was consequently necessary to smooth the data before beginning the analysis. Both the hospital admissions and the general population were grouped into quinquennial age periods. The subsequent smoothing and interpolations were made by applying the method of osculatory interpolation as illustrated by John Burns, F. I. A., in the appendix to his "Vital Statistics Explained". From the smoothed data the probability of mental disease at each age was obtained by the usual formula, that is $s_x = 2i_x \div (2l_x + i_x)$ where s_x represents the probability of mental disease at age x, i_x, the number becoming mental patients during the xth year, and l_x the total population at the same age. Good results were obtained for almost the entire range of the table. There were, however, so few cases under 13 years of age that it was necessary to assume that the incidence of mental disease began at that age. This is in fact, a safe assumption, as data carefully gathered for 20 years show that there are very few first admissions under 15 years of age, the exceptions being a small number of children suffering from epidemic encephalitis. There was corresponding difficulty at the other end of the table, as there were too few cases past 90 years of age to yield adequate rates. Consequently, the data, where necessary, were completed by extrapolating the rates graphically on the assumption of a parabolic distribution. As will be shown in the tables, there are so few mentally ill individuals to be expected at these ages that it would require an error in the rates of mental disease amounting to an exceedingly high order to cause any significant error in the resulting probabilities.

As noted above the rates of mental disease were computed for individual years, for each sex, under the categories of native and foreign-born. The nativity groups were then combined and two

additional tables were constructed representing total males and females in the State of New York.

In carrying out the analysis it was necessary to make use of life tables in conjunction with the probabilities of mental disease. Because of the fact that no complete life tables are available that include exactly the same elements utilized in the present study, it was necessary to make certain assumptions. There is no complete life table for the State of New York for 1920 for all males or for all females. It was, therefore, necessary to use tables for the U. S. Registration States, and these were kindly furnished by Dr. Louis I. Dublin, statistician of the Metropolitan Life Insurance Company, in whose statistical bureau the abridged Foudray 1920 table was completed for all intervening years. In the remaining cases it was possible to use data for the State of New York. These consist of life tables prepared in the Division of Vital Statistics in the New York State Department of Health for the following groups: Native males, native females, foreign-born males and foreign-born females. These tables, however, all begin with age 20. This is due to the fact that in the foreign-born groups, there are too few individuals at the earlier ages to permit the calculation of accurate mortality rates. In order to make all the life tables directly comparable they were begun at age 20. Since for the purpose of the present study mortality rates were needed for each year, they were supplied from birth to the 20th year on the following assumptions: In the case of the native group it was assumed that the ratio of the mortality rates at each year under 20 in 1920, to the corresponding rates in 1910, as given by Glover, was equal to the ratio of the mortality rates in 1920 at each age under 20, as given by Dr. Dublin for total whites in the U. S. Registration area, to the rates in the U. S. Registration area in 1910, as given by Glover. In the case of the foreign-born females, such assumptions gave discordant results and it was thought better, therefore, to apply the Dublin values for total white females for ages 0 to 20. Similarly in the case of the foreign-born males, the mortality rates from birth through the fifth year were assumed to be the same as given by Dublin for the native males. It is true that this introduces an element of uncertainty but the resulting error, if any, will be a slight underestimate rather than an overestimate as the mortality rates for the foreign-born actually exceed

those for the native population. However, the final error cannot be great because of the fact that the essential data relating to the number of the mentally ill do not begin until age 13, and the subsequent rates up to age 20, where the rates of mortality and mental disease refer to the same nativity groups, are too low to cause any significant statistical errors.

The subsequent analysis was made in the following manner. The total population alive and sane at the exact age x was multiplied by the corresponding value of s_x to obtain the number i_x becoming mentally ill in that age interval. If i_x is then deducted from l_x the remainder will represent the number alive at age x who did not become mentally ill during that year; this new total, multiplied by q_x, the life table rate of mortality, gives the number of the latters group who will die in the xth year. Deducting these deaths gives the population alive and sane at exact age $x + 1$. This procedure is followed for each age until the entire population has disappeared. The method may be more clearly understood by referring to Table 3, showing the probability of mental disease among total males in the State of New York in 1920. This begins with a population of 100,000 at birth. It will be noticed that there are no mental cases until the 13th year is attained. Consequently up to that year, each yearly population need be multiplied only by the rate of mortality and the corresponding deduction made to obtain the population at the succeeding age level which has remained both alive and mentally well. At age 13, there is of the original group a total of 86,388 living individuals. Multiplying this by 5.6, the rate of mental disease per 100,000 population at age 13, there results an expectation of 5 cases of mental disease. Deducting these from 86,388, there is obtained the population alive at exact age 13, who did not become mentally diseased in the 13th year. Multiplying this number, 86,383, by the rate of mortality per thousand, 2.4, gives the expected number of deaths, 207, which when deducted from 86,383 gives 86,176 as the number of white males alive and sane at exact age 14 out of a population of 100,000 at birth. This procedure thus gives the number becoming mentally ill in each age interval until the entire population has disappeared.

Beginning then with the last year to provide any cases of mental disease, proceed to add cumulatively back to birth. The cumulative

total at each age tells how many individuals out of those alive and sane at that age became mentally diseased before death. Dividing the cumulative total at any age by the population alive and sane at that age gives the expectation of mental disease at such age. Each expectation was reduced to the basis of 100. Thus in the case of the total males the expectation at birth is that 4.7 per 100 will become mentally diseased before death.

TABLE 1. NUMBER BECOMING MENTALLY ILL DURING REMAINDER OF LIFE OF 100 ALIVE AND SANE AT SPECIFIED AGE, BY NATIVITY AND SEX

Exact age in years	Total		Native		Foreign-born	
	Male	Female	Male	Female	Male	Female
0	4.7	4.4	4.3	4.0	5.4	5.2
5	5.4	5.0	4.9	4.4	6.1	5.8
10	5.4	5.1	5.0	4.4	6.2	5.8
15	5.5	5.1	5.0	4.5	6.2	5.9
20	5.3	5.0	4.9	4.4	5.8	5.7
25	5.0	4.9	4.6	4.3	5.3	5.4
30	4.7	4.6	4.3	4.1	4.9	5.1
35	4.4	4.4	4.0	3.8	4.4	4.7
40	4.0	4.1	3.7	3.5	4.0	4.3
45	3.7	3.8	3.4	3.2	3.6	4.0
50	3.4	3.4	3.1	2.9	3.3	3.6
55	3.1	3.1	2.8	2.6	3.0	3.3
60	2.8	2.9	2.6	2.4	2.8	3.1
65	2.6	2.6	2.4	2.2	2.5	2.9
70	2.3	2.4	2.1	2.0	2.3	2.7
75	2.0	2.2	1.8	1.9	2.1	2.4
80	1.8	2.0	1.5	1.7	1.9	2.2
85	1.5	1.6	1.2	1.4	1.7	1.9
90	1.2	1.3	1.0	1.2	1.4	1.7
95	1.0	1.0	0.7	1.0	0.9	1.4

Table 1 is a summarized statement of the expectations of mental disease in the several groups, beginning with birth. It should be noted that the expectation at birth of the males exceeds that of the females. In the total groups the expectations at birth are 4.7 per 100 for males and 4.4 for females. These increase to a maximum at age 15 of 5.5 for males and of 5.1 for females. In succeeding years there is a continuous decrease. It should be noted that the cumulative total of the mentally ill being the same from birth to the 13th year, the increased expectancy up to the latter year can be entirely accounted for by the decreasing life table function l_x which furnishes the denominator in the expression for the expectation of mental disease.

If now the total group is analyzed according to nativity it is seen that the expectation of mental disease among the foreign-born is higher than that among the native groups at every quinquennium, the males again exceeding the females. The expectations at birth for males are 4.3 and 5.4 per 100 for native and foreign-born respectively; for the females they are 4.0 and 5.2 respectively. In each nativity group there is a similar increase in expectation of mental disease up to approximately the 14th year and then an uninterrupted decrease. The expectation reaches a maximum of 6.2 per 100 in the foreign-born male group. It should be noted that in each case the expectation among females in the advanced age groups exceeds that of the males. In the case of the total male, total female, native male and native female groups the higher expectation for females does not occur until the 75th quinquennium; but in the case of the foreign-born the expectation for females is higher from the 25th quinquennium on. These results may be accounted for both by the higher rates of mental disease among females at the older ages and also by their greater longevity.

TABLE 2. SUMMARY OF AVERAGE ANNUAL RATES OF FIRST ADMISSIONS PER 100,000 GENERAL POPULATION TO ALL HOSPITALS FOR MENTAL DISEASES IN NEW YORK, 1919-1921 INCLUSIVE, BY AGE, NATIVITY AND SEX

Exact age in years	Total		Native		Foreign-born	
	Male	Female	Male	Female	Male	Female
0	....	....	....	....	....	....
5	....	....	....	....	....	....
10	....	....	....	....	....	....
15	34.8	24.4	29.2	18.2	86.1	51.7
20	78.1	47.5	68.4	42.2	131.8	71.3
25	94.6	70.0	83.4	61.9	129.2	94.1
30	101.6	86.6	91.4	76.9	123.4	106.8
35	106.6	91.4	98.1	85.1	124.0	107.5
40	107.7	94.0	102.1	92.5	123.4	108.5
45	102.2	99.8	96.7	94.3	114.2	117.1
50	98.6	105.6	94.0	95.7	108.9	122.0
55	106.4	108.4	101.2	98.2	116.0	119.9
60	122.1	110.5	117.1	101.2	131.8	124.8
65	148.5	134.7	142.7	112.3	160.3	162.7
70	190.1	166.7	183.9	136.0	203.4	217.0
75	219.7	213.8	215.0	180.2	239.0	268.9
80	260.5	279.9	245.1	234.2	291.0	353.4
85	314.0	324.5	275.0	285.5	370.5	414.0
90	345.0	347.0	306.1	343.0	433 0	482.0
95	388.5	412.5	337.0	427.0	511.0	598.0

Table 2 summarizes the rates of mental disease. In the two groups, total and native, there is a gradual increase in rates of

mental disease from adolescence to old age, with the exception of a slight decrease in the rates for males in the fourth and fifth decades of life. The rates for the foreign-born males do not show the same regularity. This results in all probability from the high rate of dementia præcox among the younger foreign-born males. After 50 years of age, however, a steady increase is clearly evidenced. The rates for foreign-born females are lower than those for foreign-born males up to the 40th quinquennium but thereafter the rates for males are the lower. In the native group no such marked differences are found in the rates for the two sexes in the early ages. The explanation may, perhaps, be found in the greater difficulty that the older foreign-born female finds in adjusting herself to different patterns of behavior and culture.

Complete data for each year of life are shown in Tables 3-8.

Charts I and II show comparative curves of expectation of mental disease among the several age and sex groups covering the entire life span. Chart I gives a graphic comparison of the rates of expectation of mental disease among males and females. The rates among males are the higher up to age 34. From age 34 to age 65 the rates for the two sexes are nearly equal, those of the females being slightly in excess. For ages from 65 years upwards the higher rate of the females is more marked.

Chart II compares by sex the expectation of mental disease throughout life among the native and foreign-born. The expectation of mental disease of the native males beginning with 4.3 per 100 at birth rises to a mixiumum of 5.0 from the 10th to the 17th year and then decreases regularly to the end of the life span. The expectation of the native females, beginning with 4.0 per 100 at birth rises to a maximum of 4.5 from the 12th to the 16th year, and decreases regularly thereafter. The expectation of the males continues in excess until the 74th year. Thereafter, as noted above, the the expectation of the females is the greater.

In the case of the foreign-born, the expectation of mental disease of the males increases from 5.4 per 100 at birth to a maximum of 6.2 from the 9th to the 15th year and then decreases. The expectation of the foreign-born females is lower than that of the males, beginning with 5.2 per 100 at birth and rising to a maximum of 5.9 from the 11th to the 15th year; beyond the 25th year the expectation of the females exceed that of the males.

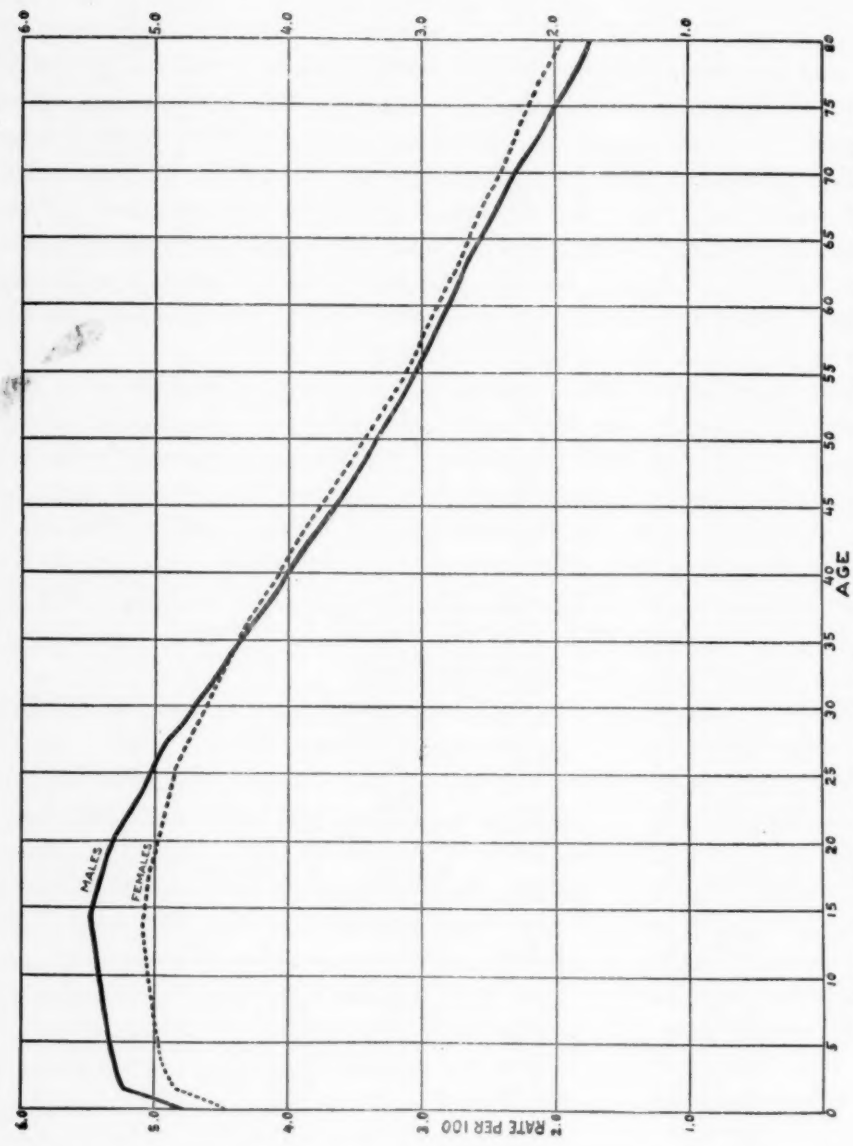

Chart 1. Expectation of mental disease among males and females in New York State per 100 alive and sane at specified ages.

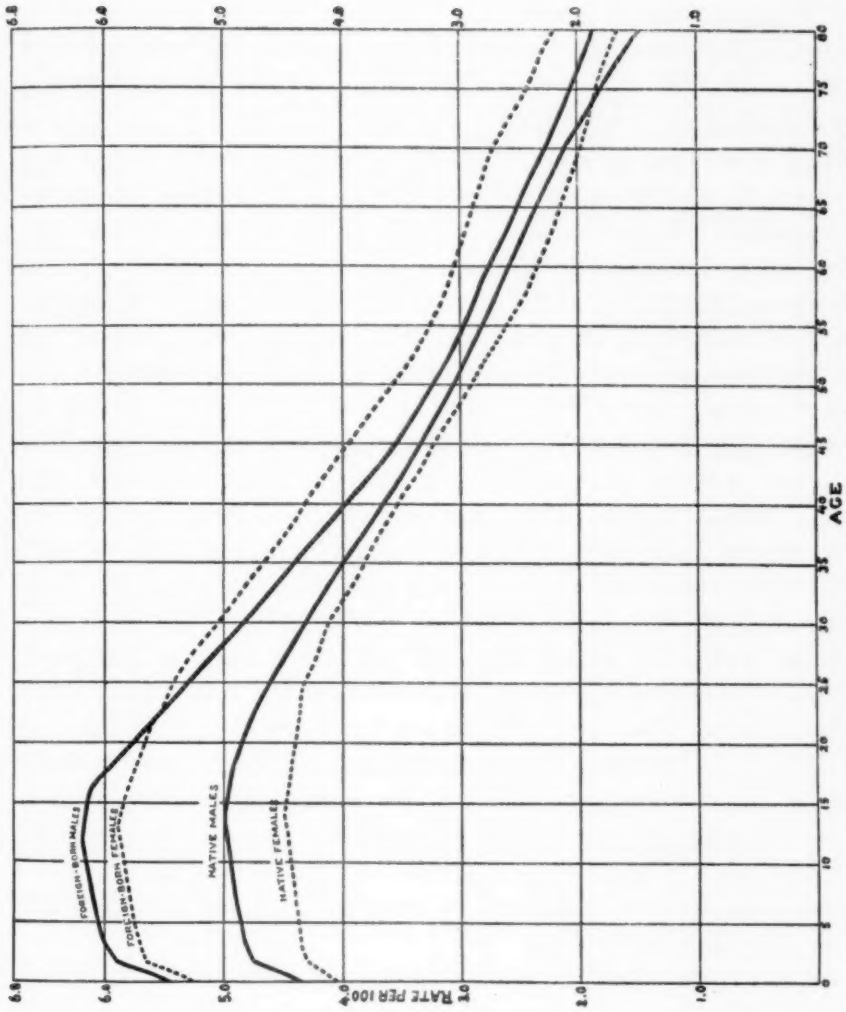

Chart 2. Expectation of mental disease in New York State per 100 alive and sane of same nativity and sex at specified ages.

Charts III and IV show rates of incidence of serious mental disease per 100,000 of population of same age, sex and nativity. As previously mentioned the rates are based on the average annual first admissions to all institutions for mental disease in New York State during the fiscal years ended June 30, 1919, 1920 and 1921. The population data were derived from the Federal Census of New York State of 1920. The data from both sources were smoothed before the rates were computed.

Chart III compares rates of mental disease among males and females from 13 to 80 years of age. It will be noted that the males have the higher rates from age 14 to age 45 and from age 56 to age 76. The rates of both sexes increase with advancing age, excepting a slight reduction in the rates of the males from age 42 to age 56.

Chart IV compares rates of mental disease by sex among the native and foreign-born population of the State. The rates of the native group are lower than those of the foreign-born group at every age. In both nativity groups the males have higher rates than the females except during the involutional and advanced age periods. These comparative rates are relatively similar to those shown by the Federal census report of "Patients in Hospitals for Mental Disease, 1923" (page 32), although the rates for New York are higher than those shown for the country as a whole.

The higher rates of expectation and the higher rates of incidence of mental disease among the foreign-born raise the question of their real significance. Do these indicate differences of a biological or social order? It has been asserted that the higher rates of mental disease among foreigners indicate their racial inferiority as compared with the native born. Such a conclusion should not be drawn from these data. Such higher rates are more probably due to environmental stresses such as are incidental to the struggle for existence in a new land.

The data of this study emphasize the seriousness of the problem of mental disease. It appears that approximately 4.5 per cent of the persons born in the State of New York may, under existing conditions, be expected to succumb to mental disease of one form or another, and become patients in hospitals for mental disease. In other words, on the average, approximately 1 person out of 22 becomes a patient in a hospital for mental disease during the life time of a generation. In the several groups shown in the tables

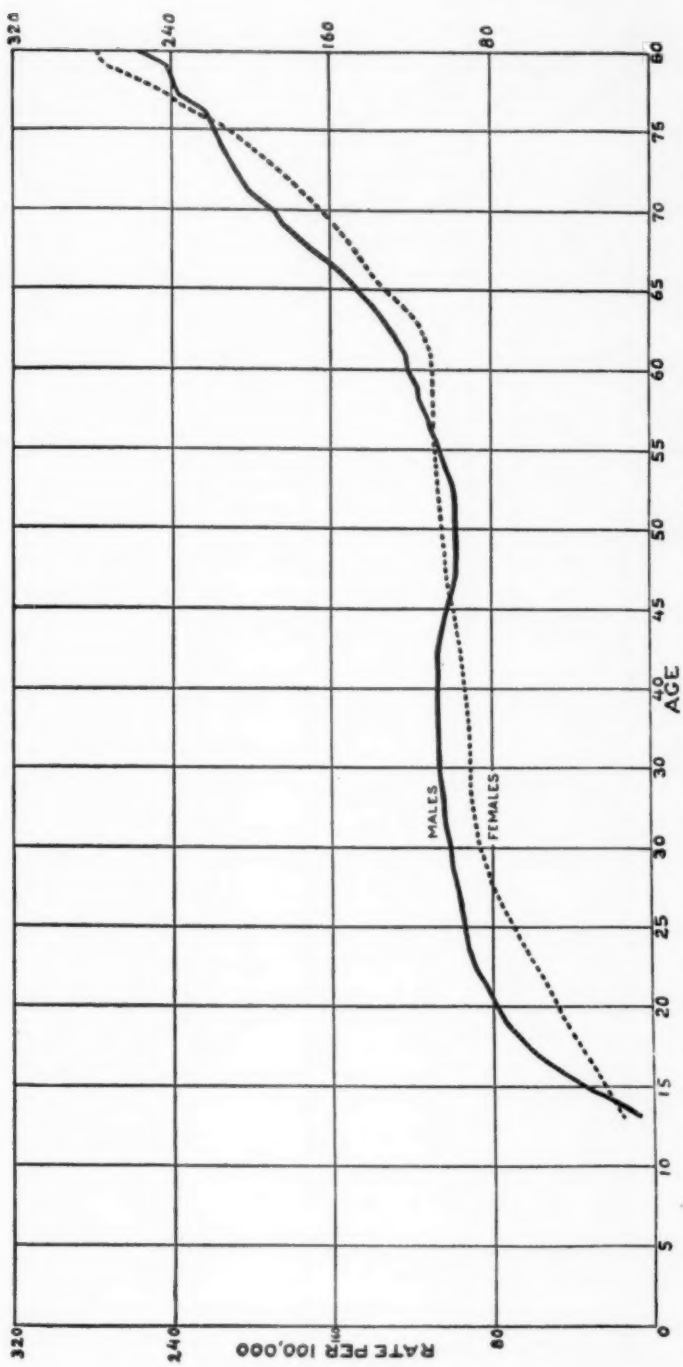

Chart 3. Rates of mental disease in New York State per 100,000 population of same age and sex.

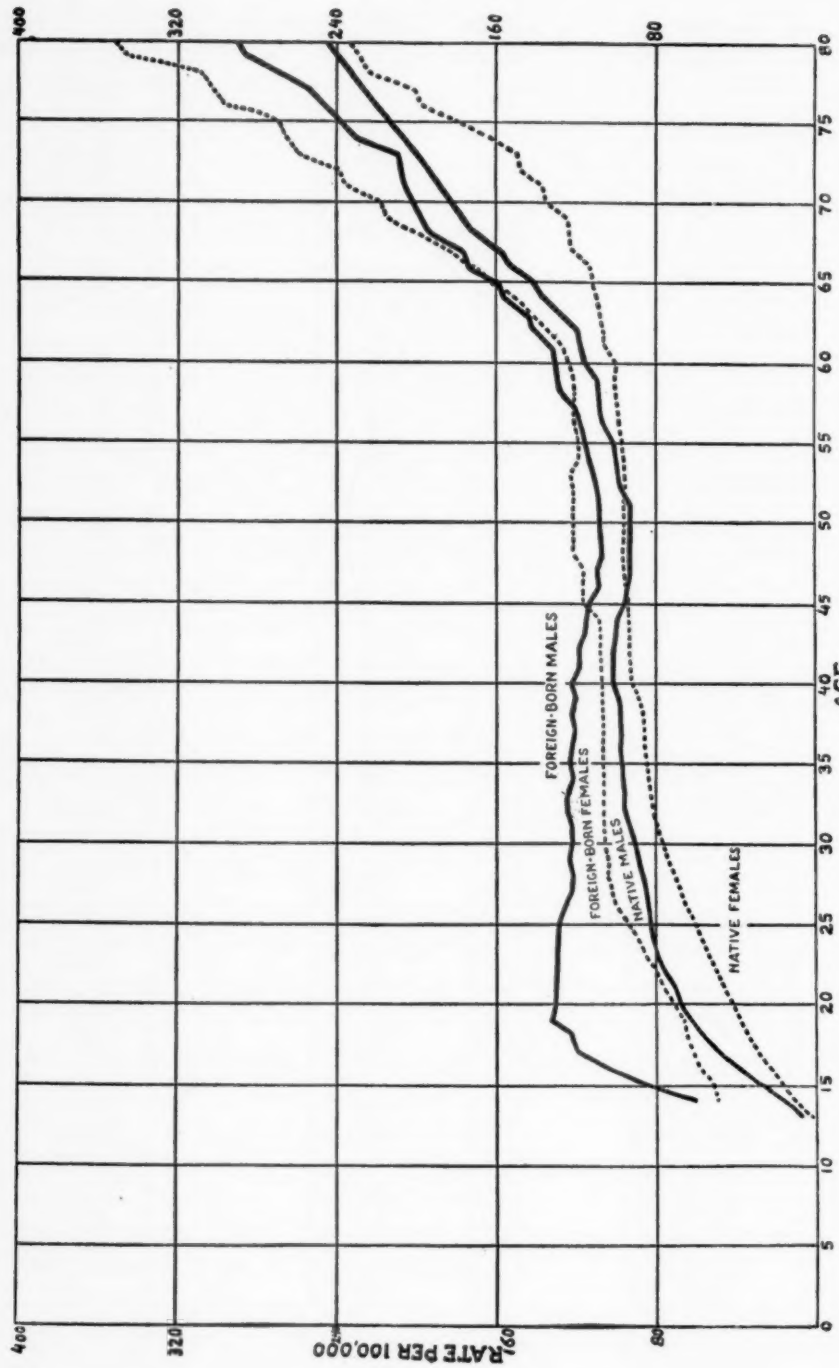

Chart 4. Rates of mental disease in New York State per 100,000 population of same sex, nativity and age.

the ratios of those becoming patients to the whole population group are as follows: All males, 1 to 21.3; all females, 1 to 22.7; native males, 1 to 23.3; native females, 1 to 25; foreign-born males, 1 to 18.5; foreign-born females, 1 to 19.2.

From the data presented in the tables similar ratios may be computed for all of the groups at any age of life. Given the age and nativity composition of any group of persons, the proportion that will probably develop serious mental disease may be determined by applying the appropriate expectation rates as given in the tables. The following tabulation furnishes simple illustrations

PROBABLE NUMBER AMONG CERTAIN SOCIAL GROUPS WHO WILL DEVELOP SERIOUS MENTAL DISEASE AND BECOME PATIENTS IN A HOSPITAL FOR MENTAL DISEASE*

	Probable cases of mental disease
Among 117,000 male children born in New York State in 1927	5,000
Among 111,000 female children born in New York State in 1927	4,400
Among 1,030,000 boys in public schools of New York State in 1927	51,500
Among 990,000 girls in public schools in New York State in 1927	44,000
Among 194,000 male immigrants to the United States in year ended June 30, 1927	10,000
Among 141,000 female immigrants to the United States in year ended June 30, 1927	7,300
Among 3,500,000 World War veterans with average age of 35 years	154,000

* Round numbers are used as most of the data given are approximations.

In presenting these results we do not desire to leave the impression that mental disease is a fatalistic matter; that it is as certain as old age or death. Under present conditions, however, mental disease occurs among the general population with striking regularity and it seems probable that the rate of incidence will not greatly change until the principles of mental hygiene are better known and more widely adopted.

TABLE 3. EXPECTATION OF MENTAL DISEASE AMONG MALES IN NEW YORK STATE, 1920

Age interval, years	Of 100,000 persons born alive		Rate of mental disease per 100,000	Rate of mortality per 1,000	Expectation of mental disease
Period of lifetime between two exact ages	Number alive and sane at beginning of age interval	Number becoming mentally ill in age interval	Number becoming mentally ill during age interval among 100,000 alive and sane at beginning of age interval	Number dying in age interval per 1,000 alive at beginning of interval and remaining sane during interval	Number becoming mentally ill during remainder of life of 100 alive and sane at beginning of age interval
x to $x+1$	l_x	i_x	$100{,}000\ s_x$	$1{,}000\ q_x$	$\frac{t_x = \sum_{x}^{100} i_x}{l_x}$
0–1	100,000	...	...	84.3	4.7
1–2	91,570	...	...	17.6	5.2
2–3	89,958	...	...	8.5	5.3
3–4	89,193	...	...	5.9	5.3
4–5	88,667	...	...	4.6	5.3
5–6	88,259	...	...	3.9	5.4
6–7	87,915	...	...	3.4	5.4
7–8	87,616	...	...	3.0	5.4
8–9	87,353	...	...	2.5	5.4
9–10	87,135	...	...	2.2	5.4
10–11	86,943	...	...	2.1	5.4
11–12	86,760	...	...	2.1	5.4
12–13	86,578	...	...	2.2	5.4
13–14	86,388	5	5.6	2.4	5.4
14–15	86,176	17	19.3	2.7	5.4
15–16	85,943	30	34.8	3.2	5.4
16–17	85,638	41	47.3	3.6	5.4
17–18	85,289	50	58.7	3.9	5.4
18–19	84,907	56	66.5	4.2	5.4
19–20	84,495	63	74.2	4.4	5.4
20–21	84,060	66	78.1	4.6	5.3
21–22	83,608	69	82.7	4.8	5.3
22–23	83,138	73	87.8	5.0	5.2
23–24	82,650	75	91.0	5.1	5.1
24–25	82,154	76	93.0	5.3	5.1
25–26	81,643	77	94.6	5.4	5.0
26–27	81,126	77	95.4	5.6	5.0
27–28	80,595	78	96.9	5.8	4.9
28–29	80,050	19	98.3	6.0	4.8
29–30	79,491	80	100.2	6.2	4.8
30–31	78,919	80	101.6	6.5	4.7
31–32	78,327	81	103.3	6.7	4.6
32–33	77,722	81	104.3	6.9	4.6
33–34	77,105	82	105.8	7.0	4.5
34–35	76,484	81	106.0	7.2	4.4
35–36	75,853	81	106.6	7.3	4.4

TABLE 3. EXPECTATION OF MENTAL DISEASE AMONG MALES IN NEW YORK STATE, 1920—(*Continued*)

Age interval, years	Of 100,000 persons born alive		Rate of mental disease per 100,000	Rate of mortality per 1,000	Expectation of mental disease
Period of lifetime between two exact ages	Number alive and sane at beginning of age interval	Number becoming mentally ill in age interval	Number becoming mentally ill during age interval among 100,000 alive and sane at beginning of age interval	Number dying in age interval per 1,000 alive at beginning of interval and remaining sane during interval	Number becoming mentally ill during remainder of life of 100 alive and sane at beginning of age interval
x *to* $x+1$	l_x	i_x	$100{,}000\, s_x$	$1{,}000\, q_x$	$\frac{t_x = \sum_{x}^{100} i_x}{l_x}$
36–37	75,219	81	107.2	7.4	4.3
37–38	74,582	80	107.3	7.6	4.2
38–39	73,936	80	107.6	7.8	4.1
39–40	73,280	79	108.0	8.0	4.1
40–41	72,614	78	107.7	8.2	4.0
41–42	71,941	77	107.5	8.4	3.9
42–43	71,260	77	107.4	8.7	3.9
43–44	70,564	75	106.1	8.9	3.8
44–45	69,862	73	104.9	9.2	3.7
45–46	69,147	71	102.2	9.5	3.7
46–47	68,420	69	101.0	9.9	3.6
47–48	67,674	67	99.7	10.4	3.5
48–49	66,904	66	99.0	10.9	3.4
49–50	66,109	65	98.4	11.5	3.4
50–51	65,284	64	98.6	12.2	3.4
51–52	64,424	64	99.0	12.9	3.3
52–53	63,530	63	99.6	13.8	3.2
53–54	62,591	63	100.6	14.9	3.2
54–55	61,596	64	104.1	16.1	3.1
55–56	60,541	64	106.4	17.4	3.1
56–57	59,425	65	110.2	18.8	3.0
57–58	58,244	65	112.1	20.3	3.0
58–59	56,998	66	116.2	21.7	2.9
59–60	55,697	66	117.8	23.1	2.9
60–61	54,346	66	122.1	24.6	2.8
61–62	52,945	65	123.7	26.3	2.8
62–63	51,489	66	128.7	28.4	2.7
63–64	49,963	67	134.5	30.7	2.7
64–65	48,364	68	141.1	33.4	2.7
65–66	46,683	69	148.5	36.4	2.6
66–67	44,917	70	156.7	39.6	2.5
67–68	43.071	71	165.5	43.1	2.5
68–69	41,147	71	174.9	46.9	2.4
69–70	39,149	73	185.2	51.1	2.4
70–71	37,079	70	190.1	55.5	2.3
71–72	34,955	71	201.9	60.3	2.3

TABLE 3. EXPECTATION OF MENTAL DISEASE AMONG MALES IN NEW YORK STATE, 1920—(*Continued*)

Age interval, years	Of 100,000 persons born alive		Rate of mental disease per 100,000	Rate of mortality per 1,000	Expectation of mental disease
Period of lifetime between two exact ages	Number alive and sane at beginning of age interval	Number becoming mentally ill in age interval	Number becoming mentally ill during age interval among 100,000 alive and sane at beginning of age interval	Number dying in age interval per 1,000 alive at beginning of interval and remaining sane during interval	Number becoming mentally ill during remainder of life of 100 alive and sane at beginning of age interval
x *to* $x+1$	l_x	i_x	$100{,}000\ s_x$	$1{,}000\ q_x$	$\dfrac{t_x = \sum_x^{100} i_x}{l_x}$
72–73	32,780	68	207.3	65.4	2.2
73–74	30,573	65	212.2	70.8	2.1
74–75	28,348	61	215.9	76.4	2.1
75–76	26,126	57	219.7	82.4	2.0
76–77	23,921	53	222.3	89.0	2.0
77–78	21,744	52	237.4	96.4	1.9
78–79	19,601	47	240.1	104.8	1.8
79–80	17,505	42	241.6	114.2	1.8
80–81	15,469	40	260.5	124.4	1.8
81–82	13,510	38	282.6	135.2	1.7
82–83	11,651	36	307.5	146.0	1.7
83–84	9,919	31	309.1	156.8	1.6
84–85	8,334	26	311.5	167.8	1.5
85–86	6,914	22	314.0	179.3	1.5
86–87	5,656	18	316.2	191.2	1.4
87–88	4,560	15	318.5	204.0	1.4
88–89	3,618	12	327.5	217.8	1.3
89–90	2,821	9	336.0	232.6	1.2
90–91	2,158	7	345.0	248.2	1.2
91–92	1,617	6	353.6	264.0	1.2
92–93	1,186	4	362.5	279.7	1.1
93–94	851	3	371.0	294.6	1.1
94–95	598	2	379.5	308.7	1.0
95–96	412	2	388.5	323.0	1.0
96–97	278	1	397.0	338.5	0.7
97–98	183	1	406.0	356.5	0.5
98–99	117	...	414.5	377.5	..
99–100	73	...	....	401.2	...
100–101	44	...	....	427.1	..
101–102	25	...	....	454.8	..
102–103	14	...	....	483.7	..
103–104	7	...	....	....	..
104–105	4	...	....	....	..
105–106	1	...	....	....	..
106–107	1	...	....	....	..
107–108	....	...	....	....	..

TABLE 4. EXPECTATION OF MENTAL DISEASE AMONG FEMALES IN NEW YORK STATE, 1920

Age interval, years	Of 100,000 persons born alive		Rate of mental disease per 100,000	Rate of mortality per 1,000	Expectation of mental disease
Period of lifetime between two exact ages	Number alive and sane at beginning of age interval	Number becoming mentally ill in age interval	Number becoming mentally ill during age interval among 100,000 alive and sane at beginning of age interval	Number dying in age interval per 1,000 alive at beginning of interval and remaining sane during interval	Number becoming mentally ill during remainder of life of 100 alive and sane at beginning of age interval
x to $x+1$	l_x	i_x	$100{,}000\ s_x$	$1{,}000\ q_x$	$t_x = \frac{\sum_x^{100} i_x}{l_x}$
0–1	100,000	...	....	67.3	4.4
1–2	93,270	...	....	15.8	4.8
2–3	91,796	...	....	7.7	4.9
3–4	91,089	...	....	5.6	4.9
4–5	90,579	...	....	4.1	5.0
5–6	90,208	...	....	3.6	5.0
6–7	89,883	...	....	3.1	5.0
7–8	89,604	...	....	2.6	5.0
8–9	89,371	...	....	2.2	5.0
9–10	89,174	...	....	1.9	5.0
10–11	89,005	...	....	1.8	5.1
11–12	88,845	...	....	1.8	5.1
12–13	88,685	...	....	1.9	5.1
13–14	88,516	13	15.2	2.1	5.1
14–15	88,317	17	19.6	2.3	5.1
15–16	88,097	21	24.4	2.7	5.1
16–17	87,838	25	28.7	3.1	5.1
17–18	87,541	30	34.1	3.5	5.1
18–19	87,205	35	39.6	3.8	5.0
19–20	86,839	38	44.1	4.3	5.0
20–21	86,428	41	47.5	4.7	5.0
21–22	85,981	45	51.9	5.1	5.0
22–23	85,498	48	56.1	5.4	4.9
23–24	84,989	52	61.0	5.7	4.9
24–25	84,453	55	65.6	6.0	4.9
25–26	83,892	59	70.0	6.2	4.9
26–27	83,313	62	74.4	6.4	4.8
27–28	82,718	65	78.2	6.5	4.8
28–29	82,116	67	81.3	6.7	4.7
29–30	81,499	68	83.1	6.8	4.7
30–31	80,877	70	86.6	6.9	4.6
31–32	80,249	70	87.7	6.9	4.6
32–33	79,626	71	89.0	7.0	4.5
33–34	78,998	72	90.9	7.0	4.4
34–35	78,374	71	91.1	7.0	4.4
35–36	77,755	71	91.4	7.0	4.4

TABLE 4. EXPECTATION OF MENTAL DISEASE AMONG FEMALES IN NEW YORK STATE, 1920—(*Continued*)

Age interval, years	Of 100,000 persons born alive		Rate of mental disease per 100,000	Rate of mortality per 1,000	Expectation of mental disease
Period of lifetime between two exact ages	Number alive and sane at beginning of age interval	Number becoming mentally ill in age interval	Number becoming mentally ill during age interval among 100,000 alive and sane at beginning of age interval	Number dying in age interval per 1,000 alive at beginning of interval and remaining sane during interval	Number becoming mentally ill during remainder of life of 100 alive and sane at beginning of age interval
x *to* $x+1$	l_x	i_x	$100{,}000\ s_x$	$1{,}000\ q_x$	$\dfrac{i_x = \sum_{x}^{100} i_x}{l_x}$
36–37	77,140	71	91.6	7.0	4.3
37–38	76,530	70	91.8	7.0	4.3
38–39	75,925	70	92.1	7.1	4.2
39–40	75,316	70	93.1	7.1	4.1
40–41	74,712	70	94.0	7.2	4.1
41–42	74,105	70	95.0	7.4	4.0
42–43	73,487	71	96.1	7.6	4.0
43–44	72,858	71	97.2	7.8	3.9
44–45	72,219	71	98.4	8.1	3.8
45–46	71,564	71	99.8	8.5	3.8
46–47	70,885	72	101.2	8.9	3.7
47–48	70,183	72	102.7	9.3	3.6
48–49	69,459	72	103.6	9.8	3.6
49–50	68,707	72	104.5	10.3	3.5
50–51	67,928	72	105.6	10.9	3.4
51–52	67,116	72	106.7	11.6	3.4
52–53	66,266	71	107.1	12.4	3.3
53–54	65,374	70	107.8	13.3	3.2
54–55	64,435	70	108.1	14.3	3.2
55–56	63,445	69	108.4	15.4	3.1
56–57	62,400	68	108.9	16.6	3.1
57–58	61,297	67	109.3	17.9	3.0
58–59	60,134	66	109.6	19.1	3.0
59–60	58,921	65	110.1	20.4	2.9
60–61	57,655	64	110.5	21.8	2.9
61–62	56,336	62	110.6	23.4	2.8
62–63	54,957	63	114.0	25.3	2.8
63–64	53,505	63	117.8	27.5	2.7
64–65	51,972	65	125.8	30.1	2.7
65–66	50,345	68	134.7	33.0	2.6
66–67	48,618	68	140.4	36.1	2.6
67–68	46,797	69	146.4	39.4	2.6
68–69	44,887	69	152.8	42.9	2.5
69–70	42,895	68	159.5	46.7	2.4
70–71	40,827	68	166.7	50.9	2.4
71–72	38,684	68	174.6	55.3	2.4

TABLE 4. EXPECTATION OF MENTAL DISEASE AMONG FEMALES IN NEW YORK STATE, 1920—(*Continued*)

Age interval, years	Of 100,000 persons born alive		Rate of mental disease per 100,000	Rate of mortality per 1,000	Expectation of mental disease
Period of lifetime between two exact ages	Number alive and sane at beginning of age interval	Number becoming mentally ill in age interval	Number becoming mentally ill during age interval among 100,000 alive and sane at beginning of age interval	Number dying in age interval per 1,000 alive at beginning of interval and remaining sane during interval	Number becoming mentally ill during remainder of life of 100 alive and sane at beginning of age interval
x *to* $x+1$	l_x	i_x	$100{,}000\ s_x$	$1{,}000\ q_x$	$\frac{t_x = \sum_{x}^{100} i_x}{l_x}$
72–73	36,481	67	183.2	60.1	2.3
73–74	34,226	66	192.5	65.2	2.3
74–75	31,933	65	202.7	70.7	2.3
75–76	29,615	63	213.8	76.6	2.2
76–77	27,288	62	226.1	83.1	2.2
77–78	24,964	60	240.1	90.1	2.1
78–79	22,660	58	256.1	97.9	2.1
79–80	20,389	56	274.4	106.6	2.0
80–81	18,166	51	279.9	116.0	2.0
81–82	16,014	48	302.0	125.8	1.9
82–83	13,957	43	306.8	135.8	1.8
83–84	12,024	40	332.2	145.9	1.8
84–85	10,236	34	332.9	156.2	1.7
85–86	8,608	29	334.5	167.0	1.6
86–87	7,146	24	336.1	178.5	1.6
87–88	5,851	20	338.1	191.0	1.4
88–89	4,717	16	341.2	205.1	1.4
89–90	3,737	13	344.0	220.6	1.4
90–91	2,902	10	347.0	237.1	1.3
91–92	2,206	8	358.6	254.2	1.3
92–93	1,639	6	373.0	271.3	1.2
93–94	1,190	5	386.0	288.2	1.2
94–95	843	3	399.0	305.2	1.1
95–96	584	2	412.5	322.4	1.0
96–97	394	2	425.5	340.1	1.0
97–98	259	1	438.0	358.4	0.8
98–99	166	1	451.5	377.1	0.6
99–100	103	...	464.5	396.1	..
100–101	62	...	....	415.7	..
101–102	36	...	....	436.3	..
102–103	20	...	....	458.6	..
103–104	11	...	....	482.7	..
104–105	6	...	....	508.1	..
105–106	3	...	....	534.9	..
106–107	1	...	....	564.1	..
107–108	....	...	....	595.2	..

TABLE 5. EXPECTATION OF MENTAL DISEASE AMONG NATIVE MALES IN NEW YORK STATE, 1920

Age interval, years	Of 100,000 persons born alive		Rate of mental disease per 100,000	Rate of mortality per 1,000	Expectation of mental disease
Period of lifetime between two exact ages	Number alive and sane at beginning of age interval	Number becoming mentally ill in age interval	Number becoming mentally ill during age interval among 100,000 alive and sane at beginning of age interval	Number dying in age interval per 1,000 alive at beginning of interval and remaining sane during interval	Number becoming mentally ill during remainder of life of 100 alive and sane at beginning of age interval
x to $x+1$	l_x	i_x	$100{,}000\ s_x$	$1{,}000\ q_x$	$\frac{t_x = \sum_{x}^{100} i_x}{l_x}$
0–1	100,000	...	....	86.1	4.3
1–2	91,390	...	....	17.7	4.7
2–3	89,772	...	....	8.5	4.8
3–4	89,009	...	....	5.8	4.8
4–5	88,493	...	....	4.5	4.9
5–6	88,095	...	....	3.9	4.9
6–7	87,751	...	....	3.4	4.9
7–8	87,453	...	....	3.0	4.9
8–9	87,191	...	....	2.5	4.9
9–10	86,973	...	....	2.6	4.9
10–11	86,747	...	....	2.4	5.0
11–12	86,539	...	....	2.3	5.0
12–13	86,340	...	....	2.3	5.0
13–14	86,141	5	6.2	2.4	5.0
14–15	85,929	13	15.3	2.6	5.0
15–16	85,693	25	29.2	2.8	5.0
16–17	85,428	34	39.9	3.5	5.0
17–18	85,095	42	49.9	3.8	5.0
18–19	84,730	49	57.3	4.1	4.9
19–20	84,334	54	63.6	4.3	4.9
20–21	83,918	57	68.4	4.3	4.9
21–22	83,500	60	71.7	4.5	4.8
22–23	83,065	64	76.6	4.7	4.8
23–24	82,611	66	79.7	4.9	4.7
24–25	82,141	68	82.4	5.1	4.7
25–26	81,654	68	83.4	5.3	4.6
26–27	81,154	68	84.4	5.5	4.6
27–28	80,640	69	85.7	5.7	4.5
28–29	80,112	70	87.4	5.9	4.4
29–30	79,570	71	89.3	6.1	4.4
30–31	79,014	72	91.4	6.3	4.3
31–32	78,445	74	93.7	6.5	4.3
32–33	77,862	75	96.1	6.7	4.2
33–34	77,266	75	96.9	6.9	4.1
34–35	76,658	75	97.8	7.1	4.1
35–36	76,039	75	98.1	7.3	4.0

TABLE 5. EXPECTATION OF MENTAL DISEASE AMONG NATIVE MALES IN NEW YORK STATE, 1920—(*Continued*)

Age interval, years	Of 100,000 persons born alive		Rate of mental disease per 100,000	Rate of mortality per 1,000	Expectation of mental disease
Period of lifetime between two exact ages	Number alive and sane at beginning of age interval	Number becoming mentally ill in age interval	Number becoming mentally ill during age interval among 100,000 alive and sane at beginning of age interval	Number dying in age interval per 1,000 alive at beginning of interval and remaining sane during interval	Number becoming mentally ill during remainder of life of 100 alive and sane at beginning of age interval
x *to* $x+1$	l_x	i_x	100,000 s_x	1,000 q_x	$t_x = \frac{\sum_{x}^{100} i_x}{l_x}$
36–37	75,409	74	98.3	7.5	3.9
37–38	74,770	74	98.5	7.8	3.9
38–39	74,113	73	99.0	8.0	3.8
39–40	73,448	73	99.4	8.3	3.7
40–41	72,766	74	102.1	8.6	3.7
41–42	72,067	74	102.1	8.9	3.6
42–43	71,352	73	102.1	9.3	3.5
43–44	70,616	72	101.6	9.7	3.4
44–45	69,860	70	100.6	10.1	3.4
45–46	69,085	67	96.7	10.6	3.4
46–47	68,286	65	95.5	11.1	3.3
47–48	67,464	64	94.7	11.6	3.2
48–49	66,618	63	94.3	12.3	3.2
49–50	65,736	62	94.0	12.9	3.1
50–51	64,827	61	94.0	13.7	3.1
51–52	63,879	60	94.1	14.5	3.0
52–53	62,894	61	97.7	15.5	3.0
53–54	61,859	61	98.5	16.5	2.9
54–55	60,778	61	99.8	17.6	2.9
55–56	59,648	60	101.2	18.8	2.8
56–57	58,468	63	106.9	20.2	2.8
57–58	57,225	62	108.5	21.6	2.7
58–59	55,928	61	109.8	23.2	2.7
59–60	54,571	61	111.0	25.0	2.6
60–61	53,147	62	117.1	26.9	2.6
61–62	51,657	61	118.7	29.1	2.6
62–63	50,095	60	120.5	31.4	2.5
63–64	48,464	62	128.8	33.9	2.4
64–65	46,761	65	138.5	36.6	2.4
65–66	44,987	64	142.7	39.5	2.4
66–67	43,149	67	154.5	42.8	2.3
67–68	41,238	66	159.3	46.3	2.3
68–69	39,266	68	173.0	50.0	2.2
69–70	37,238	66	178.4	54.1	2.2
70–71	35,161	65	183.9	58.6	2.1
71–72	33,039	63	189.6	63.3	2.1

TABLE 5. EXPECTATION OF MENTAL DISEASE AMONG NATIVE MALES IN NEW YORK STATE, 1920—(*Continued*)

Age interval, years	Of 100,000 persons born alive		Rate of mental disease per 100,000	Rate of mortality per 1,000	Expectation of mental disease
Period of lifetime between two exact ages	Number alive and sane at beginning of age interval	Number becoming mentally ill in age interval	Number becoming mentally ill during age interval among 100,000 alive and sane at beginning of age interval	Number dying in age interval per 1,000 alive at beginning of interval and remaining sane during interval	Number becoming mentally ill during remainder of life of 100 alive and sane at beginning of age interval
x *to* $x+1$	l_x	i_x	$100{,}000\ s_x$	$1{,}000\ q_x$	$\frac{l_x = \sum_{x}^{100} i_x}{l_x}$
72–73	30,889	60	195.6	68.5	2.0
73–74	28,717	58	201.9	74.1	1.9
74–75	26,535	55	208.4	80.1	1.9
75–76	24,359	52	215.0	86.5	1.8
76–77	22,204	49	221.7	93.5	1.8
77–78	20,084	46	228.3	100.9	1.7
78–79	18,016	42	234.7	109.0	1.6
79–80	16,015	39	240.5	117.6	1.6
80–81	14,097	35	245.1	126.8	1.5
81–82	12,279	31	250.6	136.7	1.4
82–83	10,574	27	257.0	147.3	1.4
83–84	8,993	24	263.0	158.6	1.4
84–85	7,547	20	269.0	170.8	1.3
85–86	6,241	17	275.0	183.7	1.2
86–87	5,081	14	281.5	197.6	1.2
87–88	4,066	12	287.6	212.4	1.2
88–89	3,193	9	293.8	228.2	1.1
89–90	2,457	7	300.0	245.0	1.1
90–91	1,850	6	306.1	262.9	1.0
91–92	1,359	4	312.5	282.0	1.0
92–93	973	3	318.5	302.4	0.9
93–94	677	2	325.0	324.0	0.9
94–95	456	2	332.0	347.0	0.9
95–96	296	1	337.0	371.5	0.7
96–97	185	1	343.6	397.5	0.5
97–98	111	...	349.8	425.1	..
98–99	64	...	356.0	454.4	..
99–100	35	...	....	485.5	..
100–101	18	...	....	518.5	..
101–102	9	...	....	553.5	..
102–103	4	...	....	590.6	..
103–104	2	...	....	629.8	..
104–105	1	...	....	671.4	..
105–106	....	...	....	....	..

TABLE 6. EXPECTATION OF MENTAL DISEASE AMONG NATIVE FEMALES IN NEW YORK STATE, 1920

Age interval, years	Of 100,000 persons born alive		Rate of mental disease per 100,000	Rate of mortality per 1,000	Expectation of mental disease
Period of lifetime between two exact ages	Number alive and sane at beginning of age interval	Number becoming mentally ill in age interval	Number becoming mentally ill during age interval among 100,000 alive and sane at beginning of age interval	Number dying in age interval per 1,000 alive at beginning of interval and remaining sane during interval	Number becoming mentally ill during remainder of life of 100 alive and sane at beginning of age interval
x to $x+1$	l_x	i_x	$100{,}000\ s_x$	$1{,}000\ q_x$	$\frac{t_x = \sum_x^{100} i_x}{l_x}$
0–1	100,000	...	....	68.9	4.0
1–2	93,110	...	....	16.0	4.3
2–3	91,620	...	....	7.8	4.3
3–4	90,905	...	....	5.6	4.4
4–5	90,396	...	....	4.0	4.4
5–6	90,034	...	....	3.6	4.4
6–7	89,710	...	....	3.1	4.4
7–8	89,342	...	....	2.6	4.4
8–9	89,199	...	....	2.1	4.4
9–10	89,012	...	....	1.9	4.4
10–11	88,843	...	....	1.8	4.4
11–12	88,683	...	....	1.8	4.4
12–13	88,523	...	....	1.9	4.5
13–14	88,355	2	2.5	2.0	4.5
14–15	88,176	10	11.4	2.3	4.5
15–16	87,963	16	18.2	2.7	4.5
16–17	87,710	21	23.9	3.1	4.5
17–18	87,417	26	29.9	3.5	4.4
18–19	87,085	30	34.8	3.9	4.4
19–20	86,715	33	38.4	4.4	4.4
20–21	86,301	36	42.2	4.4	4.4
21–22	85,885	40	46.1	4.6	4.4
22–23	85,450	43	50.0	4.7	4.4
23–24	85,006	46	54.0	4.9	4.4
24–25	84,544	49	57.9	5.1	4.4
25–26	84,064	52	61.9	5.2	4.3
26–27	83,575	55	66.0	5.3	4.3
27–28	83,077	57	68.8	5.5	4.2
28–29	82,563	59	71.9	5.6	4.2
29–30	82,042	62	75.2	5.8	4.2
30–31	81,505	63	76.9	5.9	4.1
31–32	80,961	65	80.7	6.0	4.1
32–33	80,411	67	82.8	6.2	4.0
33–34	79,846	67	83.4	6.3	3.9
34–35	79,276	67	84.2	6.4	3.9
35–36	78,702	67	85.1	6.6	3.8

TABLE 6. EXPECTATION OF MENTAL DISEASE AMONG NATIVE FEMALES IN NEW YORK STATE, 1920—(*Continued*)

Age interval, years	Of 100,000 persons born alive		Rate of mental disease per 100,000	Rate of mortality per 1,000	Expectation of mental disease
Period of lifetime between two exact ages	Number alive and sane at beginning of age interval	Number becoming mentally ill in age interval	Number becoming mentally ill during age interval among 100,000 alive and sane at beginning of age interval	Number dying in age interval per 1,000 alive at beginning of interval and remaining sane during interval	Number becoming mentally ill during remainder of life of 100 alive and sane at beginning of age interval
x to $x+1$	l_x	i_x	$100{,}000\ s_x$	$1{,}000\ q_x$	$t_x = \frac{\sum_x^{100} i_x}{l_x}$
36–37	78,116	67	86.0	6.7	3.8
37–38	77,526	67	86.7	6.9	3.7
38–39	76,925	67	87.2	7.1	3.7
39–40	76,312	69	89.9	7.3	3.6
40–41	75,686	70	92.5	7.5	3.5
41–42	75,049	70	92.7	7.8	3.5
42–43	74,394	69	93.1	8.0	3.4
43–44	73,730	69	93.5	8.3	3.3
44–45	73,000	69	93.9	8.7	3.3
45–46	72,297	68	94.3	9.0	3.2
46–47	71,579	68	94.7	9.5	3.2
47–48	70,832	67	95.1	9.9	3.1
48–49	70,064	67	95.5	10.4	3.0
49–50	69,269	66	95.6	11.0	3.0
50–51	68,442	65	95.7	11.7	2.9
51–52	67,577	65	95.9	12.4	2.9
52–53	66,675	64	96.2	13.2	2.8
53–54	65,732	64	96.7	14.1	2.7
54–55	64,742	63	97.3	15.1	2.7
55–56	63,702	63	98.2	16.2	2.6
56–57	62,608	62	99.0	17.4	2.6
57–58	61,458	61	99.7	18.7	2.5
58–59	60,249	60	100.3	20.1	2.4
59–60	58,979	59	100.7	21.7	2.4
60–61	57,641	58	101.2	23.5	2.4
61–62	56,230	60	106.7	25.4	2.3
62–63	54,743	59	107.7	27.5	2.3
63–64	53,180	58	108.9	29.8	2.2
64–65	51,539	57	110.5	32.4	2.2
65–66	49,814	56	112.3	35.1	2.2
66–67	48,011	55	114.0	38.1	2.1
67–68	46,129	57	123.0	41.3	2.1
68–69	44,169	55	124 5	44.8	2.1
69–70	42,138	53	125.6	48.7	2.0
70–71	40,035	54	136.0	52.8	2.0
71–72	37,870	52	137.0	57.3	2.0

TABLE 6. EXPECTATION OF MENTAL DISEASE AMONG NATIVE FEMALES IN NEW YORK STATE, 1920—(*Continued*)

Age interval, years	Of 100,000 persons born alive		Rate of mental disease per 100,000	Rate of mortality per 1,000	Expectation of mental disease
Period of lifetime between two exact ages	Number alive and sane at beginning of age interval	Number becoming mentally ill in age interval	Number becoming mentally ill during age interval among 100,000 alive and sane at beginning of age interval	Number dying in age interval per 1,000 alive at beginning of interval and remaining sane during interval	Number becoming mentally ill during remainder of life of 100 alive and sane at beginning of age interval
x *to* $x+1$	l_x	i_x	$100{,}000\ s_x$	$1{,}000\ q_x$	$t_x = \frac{\sum_{x}^{100} i_x}{l_x}$
72–73	35,651	53	149.0	62.1	1.9
73–74	33,387	50	150.2	67.4	1.9
74–75	31,090	51	164.3	73.0	1.9
75–76	28,773	52	180.2	79.1	1.9
76–77	26,449	53	198.5	85.6	1.8
77–78	24,137	49	201.7	92.7	1.8
78–79	21,855	49	225.0	100.3	1.8
79–80	19,619	45	229.8	108.4	1.7
80–81	17,452	41	234.2	117.2	1.7
81–82	15,370	37	237.8	126.5	1.6
82–83	13,393	37	274.2	136.6	1.6
83–84	11,532	32	280.1	147.3	1.5
84–85	9,806	28	284.4	158.9	1.4
85–86	8,224	23	285.5	171.2	1.4
86–87	6,797	20	296.5	184.4	1.4
87–88	5,527	17	307.8	198.4	1.4
88–89	4,417	14	319.0	213.4	1.3
89–90	3,463	11	330.2	229.5	1.3
90–91	2,660	9	343.0	246.5	1.2
91–92	1,998	7	356.5	264.7	1.2
92–93	1,464	5	369.5	284.1	1.2
93–94	1,044	4	382.0	304.8	1.1
94–95	723	3	394.5	326.7	1.1
95–96	485	2	427.0	350.1	1.0
96–97	314	1	456.0	374.9	1.0
97–98	196	1	485.0	401.3	1.0
98–99	117	1	520.0	429.3	0.9
99–100	66	...	549.0	459.0	..
100–101	36	...	....	490.5	..
101–102	18	...	....	524.0	..
102–103	9	...	....	559.4	..
103–104	4	...	....	597.0	..
104–105	2	...	....	636.8	..
105–106	1	...	....	678.9	..

TABLE 7. EXPECTATION OF MENTAL DISEASE AMONG FOREIGN-BORN MALES IN NEW YORK STATE, 1920

Age interval, years	Of 100,000 persons born alive		Rate of mental disease per 100,000	Rate of mortality per 1,000	Expectation of mental disease
Period of lifetime between two exact ages	Number alive and sane at beginning of age interval	Number becoming mentally ill in age interval	Number becoming mentally ill during age interval among 100,000 alive and sane at beginning of age interval	Number dying in age interval per 1,000 alive at beginning of interval and remaining sane during interval	Number becoming mentally ill during remainder of life of 100 alive and sane at beginning of age interval
x to $x+1$	l_x	i_x	$100{,}000\ s_x$	$1{,}000\ q_x$	$t_x = \frac{\sum_{x}^{100} i_x}{l_x}$
0–1	100,000	...	....	84.3	5.4
1–2	91,570	...	....	17.6	5.8
2–3	89,958	...	....	8.5	6.0
3–4	89,193	...	....	5.9	6.0
4–5	88,667	...	....	4.6	6.0
5–6	88,259	...	....	4.8	6.1
6–7	87,835	...	....	3.9	6.1
7–8	87,492	...	....	3.4	6.1
8–9	87,195	...	....	2.8	6.1
9–10	86,951	...	....	2.4	6.2
10–11	86,742	...	....	2.2	6.2
11–12	86,551	...	....	2.1	6.2
12–13	86,369	...	....	2.2	6.2
13–14	86,179	...	....	2.5	6.2
14–15	85,964	52	60.2	2.8	6.2
15–16	85,671	74	86.1	3.3	6.2
16–17	85,315	90	106.0	3.8	6.1
17–18	84,901	102	120.6	4.3	6.1
18–19	84,434	105	123.9	4.7	6.0
19–20	83,933	112	132.9	4.8	5.9
20–21	83,409	110	131.8	5.3	5.8
21–22	82,858	108	130.9	5.3	5.7
22–23	82,311	107	130.5	5.4	5.6
23–24	81,760	107	130.3	5.4	5.5
24–25	81,212	106	130.0	5.5	5.4
25–26	80,660	104	129.2	5.6	5.3
26–27	80,105	101	126.4	5.7	5.2
27–28	79,548	98	123.4	5.8	5.1
28–29	78,989	97	123.0	5.9	5.0
29–30	78,426	97	124.0	6.0	4.9
30–31	77,859	96	123.4	6.1	4.9
31–32	77,289	96	123.8	6.2	4.8
32–33	76,714	96	124.9	6.4	4.7
33–34	76,128	95	124.4	6.5	4.6
34–35	75,539	93	122.6	6.7	4.5

TABLE 7. EXPECTATION OF MENTAL DISEASE AMONG FOREIGN-BORN MALES IN NEW YORK STATE, 1920—(*Continued*)

Age interval, years	Of 100,000 persons born alive		Rate of mental disease per 100,000	Rate of mortality per 1,000	Expectation of mental disease
Period of lifetime between two exact ages	Number alive and sane at beginning of age interval	Number becoming mentally ill in age interval	Number becoming mentally ill during age interval among 100,000 alive and sane at beginning of age interval	Number dying in age interval per 1,000 alive at beginning of interval and remaining sane during interval	Number becoming mentally ill during remainder of life of 100 alive and sane at beginning of age interval
x *to* $x+1$	l_x	i_x	$100{,}000\ s_x$	$1{,}000\ q_x$	$\frac{t_x = \sum_{x}^{100} i_x}{l_x}$
35–36	74,941	93	124.0	7.0	4.4
36–37	74,324	91	123.1	7.2	4.3
37–38	73,699	90	122.0	7.5	4.2
38–39	73,057	90	123.3	7.8	4.2
39–40	72,398	88	121.9	8.1	4.1
40–41	71,724	89	123.4	8.5	4.0
41–42	71,026	85	119.8	8.9	3.9
42–43	70,310	84	119.5	9.3	3.8
43–44	69,573	82	117.3	9.8	3.7
44–45	68,810	80	115.6	10.4	3.7
45–46	68,015	78	114.2	11.0	3.6
46–47	67,190	74	109.4	11.7	3.5
47–48	66,331	73	110.7	12.5	3.4
48–49	65,430	71	108.0	13.3	3.4
49–50	64,490	70	108.5	14.2	3.3
50–51	63,505	69	108.9	15.2	3.3
51–52	62,472	68	109.5	16.3	3.2
52–53	61,387	68	110.5	17.4	3.1
53–54	60,252	67	112.0	18.7	3.1
54–55	59,060	67	113.7	20.1	3.0
55–56	57,807	67	116.0	21.6	3.3
56–57	56,493	67	118.4	23.3	2.9
57–58	55,111	66	120.4	25.1	2.9
58–59	53,663	69	128.3	27.0	2.9
59–60	52,147	68	130.1	29.1	2.8
60–61	50,564	67	131.8	31.4	2.8
61–62	48,911	65	133.4	33.8	2.7
62–63	47,195	67	143.0	36.5	2.7
63–64	45,408	66	145.4	39.3	2.6
64–65	43,560	68	157.1	42.4	2.6
65–66	41,648	67	160.3	45.7	2.5
66–67	39,681	69	174.4	49.2	2.5
67–68	37,663	67	178.2	53.0	2.4
68–69	35,603	69	194.8	57.1	2.4
69–70	33,505	67	199.3	61.5	2.4
70–71	31,382	64	203.4	66.2	2.3
71–72	29,245	61	207.0	71.2	2.2

TABLE 7. EXPECTATION OF MENTAL DISEASE AMONG FOREIGN-BORN MALES IN NEW YORK STATE, 1920—(*Continued*)

Age interval, years	Of 100,000 persons born alive		Rate of mental disease per 100,000	Rate of mortality per 1,000	Expectation of mental disease
Period of lifetime between two exact ages	Number alive and sane at beginning of age interval	Number becoming mentally ill in age interval	Number becoming mentally ill during age interval among 100,000 alive and sane at beginning of age interval	Number dying in age interval per 1,000 alive at beginning of interval and remaining sane during interval	Number becoming mentally ill during remainder of life of 100 alive and sane at beginning of age interval
x *to* $x+1$	l_x	i_x	$100{,}000\ s_x$	$1{,}000\ q_x$	$t_x = \frac{\sum_{x}^{100} i_x}{l_x}$
72–73	27,106	57	209.6	76.6	2.2
73–74	24,977	53	210.4	82.4	2.2
74–75	22,870	53	232.1	88.5	2.1
75–76	20,798	50	239.0	95.1	2.1
76–77	18,775	46	247.0	102.1	2.0
77–78	16,817	43	254.3	109.5	2.0
78–79	14,937	40	271.0	117.5	2.0
79–80	13,147	38	287.5	126.0	1.9
80–81	11,457	33	291.0	135.0	1.9
81–82	9,882	30	306.0	144.7	1.9
82–83	8,426	28	327.1	154.9	1.8
83–84	7,097	24	334.0	165.8	1.8
84–85	5,900	21	360.5	177.3	1.7
85–86	4,837	18	370.5	189.6	1.7
86–87	3,905	15	378.0	202.7	1.6
87–88	3,101	12	386.0	216.5	1.5
88–89	2,420	9	390.5	231.2	1.4
89–90	1,854	7	392.5	246.7	1.4
90–91	1,391	6	433.0	263.2	1.4
91–92	1,020	5	449.4	280.7	1.4
92–93	730	3	464.0	299.2	1.2
93–94	509	2	479.0	318.8	1.2
94–95	345	2	493.0	339.5	1.2
95–96	227	1	511.0	361.4	0.9
96–97	144	1	629.0	384.6	0.7
97–98	88	...	547.0	409.1	..
98–99	52	...	564.0	435.0	..
99–100	29	...	572.0	462.4	..
100–101	16	...	....	491.2	..
101–102	8	...	....	521.7	..
102–103	4	...	....	553.9	..
103–104	2	...	....	587.8	..
104–105	1	...	....	623.6	..
105–106	0	...	....	....	..

TABLE 8. EXPECTATION OF MENTAL DISEASE AMONG FOREIGN-BORN FEMALES IN NEW YORK STATE, 1920

Age interval, years	Of 100,000 persons born alive		Rate of mental disease per 100,000	Rate of mortality per 1,000	Expectation of mental disease
Period of lifetime between two exact ages	Number alive and sane at beginning of age interval	Number becoming mentally ill in age interval	Number becoming mentally ill during age interval among 100,000 alive and sane at beginning of age interval	Number dying in age interval per 1,000 alive at beginning of interval and remaining sane during interval	Number becoming mentally ill during remainder of life of 100 alive and sane at beginning of age interval
x to $x+1$	l_x	i_x	$100{,}000\, s_x$	$1{,}000\, q_x$	$\frac{t_x = \sum_{x}^{100} i_x}{l_x}$
0–1	100,000	...	....	67.3	5.2
1–2	93,270	...	....	15.8	5.6
2–3	91,796	...	....	7.7	5.7
3–4	91,089	...	....	5.6	5.7
4–5	90,579	...	....	4.1	5.7
5–6	90,208	...	....	3.6	5.8
6–7	89,883	...	....	3.1	5.8
7–8	89,604	...	....	2.6	5.8
8–9	89,371	...	....	2.2	5.8
9–10	89,174	...	....	1.9	5.8
10–11	89,005	...	....	1.8	5.8
11–12	88,845	...	....	1.8	5.9
12–13	88,685	...	....	1.9	5.9
13–14	88,516	...	....	2.1	5.9
14–15	88,330	44	50.0	2.3	5.9
15–16	88,083	46	51.7	2.7	5.9
16–17	87,799	52	59.0	3.1	5.8
17–18	87,475	54	62.0	3.5	5.8
18–19	87,115	57	65.2	3.8	5.7
19–20	86,727	57	65.7	4.3	5.7
20–21	86,297	62	71.3	4.7	5.7
21–22	85,830	65	76.0	4.9	5.6
22–23	85,345	68	79.6	5.0	5.6
23–24	84,851	73	85.7	5.0	5.5
24–25	84,354	76	89.9	5.0	5.4
25–26	83,857	79	94.1	5.0	5.4
26–27	83,359	84	101.2	5.1	5.4
27–28	82,850	85	102.7	5.1	5.3
28–29	82,343	87	105.3	5.1	5.2
29–30	81,836	87	105.7	5.2	5.1
30–31	81,324	87	106.8	5.3	5.1
31–32	80,806	86	106.8	5.4	5.0
32–33	80,284	86	106.8	5.5	4.9
33–34	79,757	85	107.0	5.6	4.8
34–35	79,226	85	107.0	5.8	4.8
35–36	78,682	85	107.5	5.9	4.7

TABLE 8. EXPECTATION OF MENTAL DISEASE AMONG FOREIGN-BORN FEMALES IN NEW YORK STATE, 1920—(*Continued*)

Age interval, years	Of 100,000 persons born alive		Rate of mental disease per 100,000	Rate of mortality per 1,000	Expectation of mental disease
Period of lifetime between two exact ages	Number alive and sane at beginning of age interval	Number becoming mentally ill in age interval	Number becoming mentally ill during age interval among 100,000 alive and sane at beginning of age interval	Number dying in age interval per 1,000 alive at beginning of interval and remaining sane during interval	Number becoming mentally ill during remainder of life of 100 alive and sane at beginning of age interval
x to $x+1$	l_x	i_x	$100{,}000\ s_x$	$1{,}000\ q_x$	$\frac{t_x = \sum_{x}^{100} i_x}{l_x}$
36–37	78,133	84	107.5	6.1	4.6
37–38	77,573	83	107.6	6.3	4.5
38–39	77,002	83	108.0	6.6	4.4
39–40	76,411	83	108.0	6.9	4.4
40–41	75,801	82	108.5	7.2	4.3
41–42	75,174	82	108.5	7.6	4.3
42–43	74,521	81	109.0	8.0	4.2
43–44	73,844	80	109.0	8.5	4.1
44–45	73,137	80	109.5	9.0	4.0
45–46	72,399	85	117.1	9.6	4.0
46–47	71,620	84	117.6	10.2	3.9
47–48	70,806	83	117.8	10.9	3.8
48–49	69,952	85	122.0	11.7	3.7
49–50	69,050	84	122.0	12.6	3.7
50–51	68,096	83	122.0	13.5	3.6
51–52	67,095	82	122.0	14.2	3.5
52–53	66,061	81	122.3	15.7	3.4
53–54	64,944	80	123.1	16.9	3.4
54–55	63,768	76	118.9	18.3	3.3
55–56	62,526	75	119.9	19.8	3.3
56–57	61,214	74	120.9	21.4	3.2
57–58	59,832	72	121.0	23.1	3.2
58–59	58,380	71	121.6	25.0	3.1
59–60	56,851	69	122.0	27.1	3.1
60–61	55,243	69	124.8	29.3	3.1
61–62	53,557	68	127.7	31.7	3.0
62–63	51,793	70	135.4	34.3	3.0
63–64	49,949	72	143.7	37.1	3.0
64–65	48,027	73	152.8	40.1	2.9
65–66	46,031	75	162.7	43.4	2.9
66–67	43,962	76	173.6	46.9	2.9
67–68	41,828	78	185.7	50.6	2.8
68–69	39,637	78	198.0	54.7	2.8
69–70	37,395	80	214.4	59.0	2.8
70–71	35,113	76	217.0	63.6	2.7
71–72	32,809	77	234.9	68.6	2.7

TABLE 8. EXPECTATION OF MENTAL DISEASE AMONG FOREIGN-BORN FEMALES IN NEW YORK STATE, 1920—(*Continued*)

Age interval, years	Of 100,000 persons born alive		Rate of mental disease per 100,000	Rate of mortality per 1,000	Expectation of mental disease
Period of lifetime between two exact ages	Number alive and sane at beginning of age interval	Number becoming mentally ill in age interval	Number becoming mentally ill during age interval among 100,000 alive and sane at beginning of age interval	Number dying in age interval per 1,000 alive at beginning of interval and remaining sane during interval	Number becoming mentally ill during remainder of life of 100 alive and sane at beginning of age interval
x *to* $x+1$	l	i_x	$100{,}000\ s_x$	$1{,}000\ q_x$	$\frac{l_x = \sum_{x}^{100} i_x}{l_x}$
72–73	30,487	73	238.3	73.9	2.6
73–74	28,166	73	259.9	79.6	2.6
74–75	25,857	68	264.5	85.7	2.5
75–76	23,579	63	268.9	92.1	2.4
76–77	21,350	64	297.5	99.1	2.4
77–78	19,177	58	303.4	106.5	2.4
78–79	17,083	53	308.4	114.4	2.3
79–80	15,082	52	346.7	122.8	2.3
80–81	13,184	47	353.4	131.7	2.2
81–82	11,407	41	358.9	141.2	2.2
82–83	9,761	37	377.0	151.3	2.1
83–84	8,253	32	390.0	162.1	2.1
84–85	6,888	28	404.0	173.5	2.0
85–86	5,670	23	414.0	185.6	1.9
86–87	4,599	20	425.5	198.5	1.9
87–88	3,670	16	438.0	212.2	1.8
88–89	2,879	13	450.0	226.7	1.8
89–90	2,216	10	465.0	242.0	1.7
90–91	1,672	8	482.0	258.3	1.7
91–92	1,234	6	500.0	275.6	1.6
92–93	890	5	523.0	293.8	1.6
93–94	625	3	547.0	313.2	1.4
94–95	427	2	572.0	333.6	1.4
95–96	283	2	598.0	355.2	1.4
96–97	181	1	624.0	378.1	1.1
97–98	112	1	648.0	402.2	0.9
98–99	66	...	680.0	427.7	0.6
99–100	38	...	710.0	454.7	..
100–101	21	...	....	454.7	..
101–102	11	...	....	513.2	..
102–103	5	...	....	544.8	..
103–104	2	...	....	578.3	..
104–105	1	...	....	613.5	..
105–106	....	...	....	....	..

BOOK REVIEWS

The Meaning of Disease, An Inquiry in the Field of Medical Philosophy. By WILLIAM A. WHITE, A. M., M. D.; 220 Pages. The Williams and Wilkins Company, Baltimore Md.

In this book of some 200 pages the author attempts a philosophical formulation of a theory of disease reminding us of a statement by Whitehead: "It is a well founded historical generalization that the last thing to be discovered in any science is what the science is really about. Men go on groping for centuries, guided merely by a dim instinct and puzzled curiosity, till at last 'Some great truth is loosened'." By collecting material from all sources and presenting it from the synthetical standpoint rather than the analytical he emphasizes a new angle of medical thought.

Starting from the dictionary definition he elaborates, using well applied allusions as the heading of each chapter with frequent references to the allied work of others and copious quotations to strengthen certain points.

Discussing well-known somatic facts he ranges the psyche alongside and says "That any attempt to explain the human organism which leaves the psyche out of consideration is bound to fail in completeness and, too, to go a step further, in-as-much as man is a social animal, any attempt to reach a full understanding of him that leaves out of account his social relations is also bound for failure."

Mental reactions, as we know them, have a historical development as old as are the bodily reactions * * * it follows then that the psyche must have its embryology, its comparative anatomy and its palcontology; through further elaboration he goes on to say that for every situation there is as well a psychic as a somatic aspect. Body is one aspect of energy which he calls energy laid down in structure or structuralized function. Mind is another aspect of energy. Here the process of thinking is function, and the content of thought is structure. "Any new problem of adjustment requires a redistribution of energy and when energy is redistributed in the body the stresses fall in different places, and that organic disease may be related to this redistribution of stress." "Disease tends to mobilize all these primitive and negating trends which have not found a proper place in the development of the organism, and there are organized a group of factors which ally themselves with the disease." "We have concluded, among other things, that the psyche was as old as the soma and that for each situation there is as well a psychic as a somatic component. It follows from this that every disease,

that is every reaction of the organism to a noxa, must be both somatic and psychic. This is a very important corollary because it calls attention to the necessity that all syndromes have psychic components, a fact little appreciated by medicine as yet, and when feebly appreciated not understood.

He then goes on to show a still further component of environmental origin, the relation of which is not recognized outside the field of psychoanalysis.

The whole subject is dealt with in a manner characteristic of the author, is clear, logical and each point well brought out. A summary is found at the end of each chapter, the last of which is a general summary of the author's idea of the concept "disease".

GRAY.

The Matrix of the Mind. By FREDERIC W. JONES, Professor of Physical Anthropology, and STANLEY D. PORTEUS, Professor of Clinical Psychology, University of Hawaii. University Press Assn., University of Hawaii, Honolulu, T. H., 1928.

The aim of this work is to blend the subject matter of neurology and psychology. The study of the structure of the central nervous system is generally conducted in almost total disregard of its higher psychological functions. Psychology, on the other hand, generally deals only superficially with the central and sympathetic nervous systems and with little or no attempt to relate the structure to the function. The sphere of sensation, rational function, and attention are discussed largely as if they had no neurological basis whatever. The authors of this work seek to remedy this defect by correlating the functions of brain and mind. Professor Jones is responsible for the neurological section of the book which comprises about two-thirds of the whole, and Professor Porteus is responsible for the psychological section.

The efforts of the authors at correlation are interesting. But both neurology and psychology are such complex and extensive subjects of investigation that it is doubtful if either can be treated satisfactorily except by indicating the correlations with the other. Effort at interelaboration is nearly sure to confuse and detract from the clearness of both subjects. For example, neurology is so bewilderingly complex that the mind is detracted from following the necessary threads of thought, by turning to psychological functions in connection therewith.

Both authors are evidently thorough-going evolutionists and work wholly from the presuppositions of that theory. Both pursue the traditional method of beginning with the amoeba and follow the tortuous supposed ascent to man. Nearly half the section on neurology (132 pages) is devoted to comparative anatomy and neurology, with apparently no aim but to show the

supposed genesis of the human nervous system as assumed by the evolutionary theory, and which adds little of value to the student of human neurology and psychology. It is a bit wearisome to be compelled to swim through oceans of pure theoretical speculation before we can reach the consideration of a plain and self-evident fact. Yet this is what we are compelled to do in most treatments of these subjects.

Man's neurological endowments and psychological potentialities are just what they are now whatever their genesis. History in studies of this sort helps but little in understanding present fact. Our judgment is that elimination of the genetic and theoretical elaboration would be conducive to the clearer understanding of human neurology and psychology. Unnecessary elaboration hinders the mind in its quest rather than helps it. For example, "Mistakes in Brain Building", "The Fall of the Small Brain", "Linkages and Failures", the assumed *arboreal* probation of our human ancestors, are all treated as dogmatically as if they were facts of *knowledge* instead of theoretical speculations. It is surely no small presumption for any man to speak so assuredly of the "mistakes" of great nature, particularly since we may equally well and with as good warrant assume that nature does and has done exactly what she intends, and probably made no mistake about it.

The criticism of the book, from the reviewer's point of view, is that it maintains a too dogmatic attitude in general. It is rather disconcerting, for example, to find it unconditionally affirmed that the reality of a dual system of epicritic and protopathic sensibility "is a fact far more thoroughly verified today than it was when Head first described it nearly twenty years ago," notwithstanding that Dr. Stanley Cobb of Harvard has shown that the hypothesis of Head is untenable (Arch. Neur. and Psychi., Nov., 1919). The authors have too implicit faith in traditional theories. Nothing is so important as to distinguish sharply between facts and theories about facts.

The neurological section of the book, however, is a helpful contribution to the literature of the subject, particularly to the beginner. It clarifies and makes relatively simple some very complex matters. The illustrations are mostly excellent; the tracings of the sensory and motor nerves in the cord and brain-stem are specially good.

Professor Porteus contributes chapters on: Our Original Equipment, Biological Pathways, Senses and Sensibility, Facilitation, Stimuli and Response, Built-in Habits, Preparing for the Cortex, Neural Crossroads, Monotony and interest, Sense and Aliveness, Enjoyment and Appreciation, and the Cortex and Intelligence. It will be seen that his discussions are also closely related to neural considerations, pertaining primarily to reflex and instinctive reactions and correlated subjects.

Whether the aim of the work has been realized, the correlation of the

neurological and psychological functions, may be questioned, not from any fault of the well-meaning effort itself, but because it is doubtful if such a correlation in a strict sense is really possible. If we understood every detail of the nervous system and its every most subtle action, we would be psychologically no better off. From antecedent neural conditions, we can never infer a sensation or thought; from sensation and thought, we can never infer antecedent neural condition. The coordination of their occurrence is simply an opaque fact.

GEORGE S. PAINTER.

Electric Development as an Aid to Agriculture. By GUY E. TRIPP, Chairman of the Board of Directors, Westinghouse Electric and Manufacturing Co.

This little brochure of 78 pages, a collection of addresses, by Mr. Tripp, is brimfull of historical and economic facts to substantiate his views on the influence of modern electric power.

He shows how the development of water power in the New England States transformed our forebears late in the 18th century, from farmers into manufacturers thus increasing their earning capacity and improving their living conditions.

"In the South, the most inefficient form of power ever used regularly by man—the negro slave—brought wealth to a small minority, but interfered with the introduction of better forms of power, it remained poor until power in a new form became widely used."

As water power came into wider use it caused centralization of the people into small communities, the better to enjoy the improvements and advantages found in this advancement over manual labor, steam power caused a further increase in material improvements and the growth of cities. Electricity has still further added to our material wealth, productivity and urban life. Water power had the disadvantage of limiting the location of factories, the steam engine brought about those great changes that constitute the Industrial Revolution.

Electricity, because it can be transported for many miles over high tension lines should result in bringing about a decentralization of population, removing factories out of congested districts, splitting them up into smaller units and generally improving our living conditions by permitting us to live more in the style of the semi-rural.

In 1840 hardly 5 per cent of our people lived in cities, now over 50 per cent are urbanites, all of which he attributes to power developments which closed down local industries by the more efficient centralized factories in large cities. This has thrown agriculture and country life out of step with

industry and city life. Electricity will counteract this industrial centralization, he believes, by restoring the balance between industry and agriculture.

The condition of the common people remained practically stationary for all the thousands of years of recorded history until about 120 years ago. Large areas were to a considerable extent self-contained in the matter of home industries, and most of our commodities were made by hand but the old order demanding exhausting toil to produce the necessities of life passed away when in 1789 Samuel Slater founded American prosperity when he utilized water power to run a spinning mill. Power was soon applied to the manufacture of various other products and the trend to city life began.

Decentralization will come through super-power which is a system for generating electric power in large volume by water and fuel at the most favorable locations for economy and reliability and distributing it over wide areas by great inter-connected transmissive systems.

GRAY.

Orthopedic Surgery for Nurses. By PHILIP LEWIN, M. D., Associate Professor of Orthopedic Surgery, Northwestern University; Senior Attending Orthopedic Surgeon, St. Luke's Hospital, Chicago. 12 mo. of 353 Pages with 340 Illustrations. Philadelphia and London. W. B. Saunders Company, 1928. Cloth $3.25 net.

Dr. Lewin's new textbook is designed particularly for nurses and has been written in a clear, concise manner emphasizing throughout the nursing viewpoint. Dr. Lewin has had a wide experience in orthopedic surgery and it is indeed fortunate that he is giving out some of his valuable knowledge.

The book introduces the nurse to orthopedic surgery with a chapter on terminology, from which she is taken to the plaster room, the splint room, the operating room, the brace shop and the bedside of the patient. The instruments, equipment and procedures are carefully explained and the nursing care elucidated,

The chapters dealing with disease and deformities are written in an interesting manner which will hold the attention of the nurse. Unusual conditions are briefly discussed in order that the nurse may have some knowledge of them. Under treatment the explanation of exercises is quite complete and will be of much help in the nursing care of these cases.

The illustrations are exceptionally good and should be of great assistance to the nurse in obtaining a clear understanding of this important subject. The volume is thoroughly modern and up-to-date and will prove a valuable addition to the library of every nurse. The book is so arranged that it can be readily used as a textbook and will be of material aid to those teaching orthopedic surgery.

WORTHING.

Applied Chemistry for Nurses. By JOSEPH L. ROSENHOLTZ, Ph. D., Professor of Geology in the Rensselaer Polytechnic Institute; Lecturer in Chemistry in the School of Nursing, Samaritan Hospital, Troy, N. Y. Edited by Alice S. Gilman, Formerly Secretary, New York State Board of Nurse Examiners. Second Edition, Revised 12 mo., of 22 Pages. Illustrated. W. B. Saunders Co., Philadelphia, 1928. Cloth $2.00 net.

The popularity of a book is often reflected in the number of editions through which it runs. This one was copyrighted in 1924, reprinted in October, 1925, and October, 1926, revised, reprinted and recopyrighted in April, 1928.

In preparing this, the second edition, the subject matter has been thoroughly revised and additional matter introduced, chiefly in the second part of the work, devoted to some thirty experiments which bring out in a practical manner the theory of part one.

The main object of the book—to present to nurses the essentials of chemistry—has been admirably accomplished.

The first part is devoted to the theory of chemistry, the questions appended to each chapter emphasize the main points and should fix the definitions and laws in the mind of the student nurse.

The second part considers laboratory practice and has been prepared with the idea of presenting the necessary experiments and yet is not so comprehensive as to be beyond the equipment of the average hospital.

The material is given in such a clear and simple style that the nurse should easily be able to prepare herself for final hospital or State Board examinations.

An appendix contains a list of the equipment and stock chemicals required for the practical experiments.

GRAY.

Experimental Psychology. By Sir EDWARD SHARPEY-SCHAFER, F. R. S., Professor of Physiology in Edinburgh, Fourth Edition, with 92 Illustrations. Longmans, Green & Co., New York, $2.00.

This little English volume of 140 pages contains precise directions for performing many of the fundamental experiments in physiology. The experiments are so arranged and described that the student can work them out for himself. There is, however, no demarkation between those for beginners and those for advanced students.

The reviewer views with alarm the lack of sufficient directions for obtaining all of the materials to be used; the technique to be followed often leaves something to one's imagination; the results of experiments are not noted, and we find no summary or conclusions at the end of any chapter.

An excellent chapter is devoted to an explanation of the necessary electrical apparatus required, with schematic drawings to assist the amateur student to understand the various types of voltaic cells, battery circuits, induction cells, etc., used in the experiments.

Succeeding chapters are also well illustrated to show how the circuit breakers, recording drums, biological speciments, etc., are to be placed in order to bring out the correct physiological reactions.

In general the work is well written, clear and condensed. The relation of one test to another and the continuity of ideas indicate that the author has spent much time and thought in arranging the material, in this manner adding to its value especially as a textbook for teaching purposes.

GRAY.

Massage and Therapeutic Exercise. By MARY MCMILLAN, Supervisor of Aides in Physiotherapy, Medical Corps, U. S. A., 1919-20, Second Edition, Reset, 12 mo. of 331 Pages with 17 Illustrations. W. B. Saunders Co., 1925. Cloth $2.50.

Miss McMillan has had a very good opportunity to become well trained in her special branch of therapy. Previous to her experience in this country she was assistant at Sir Robert Jones' Clinic, Southern Hospital, Liverpool, England, 1911-1915 and in charge of massage and therapeutic exercise at Greenbank Cripples' Home, in the same city, 1911-1915. Since arriving in the United States she has been director of massage and medical gymnastics, Children's Hospital, Portland, Maine, 1916-1918; chief aide, Walter Reed Army Hospital; supervisor of aides in physiotherapy, Medical Corps, U. S. A., Washington, D. C., 1919-1920; as well as director of physiotherapy "courses for graduates", Harvard Medical School, 1921-1925.

She wrote the book not only for students but for those who have had short, intensive courses of theory and practice, who desire to increase their knowledge. The present edition is completely revised, and amplified more drawings showing the use of apparatus in fractures and various kinds of therapeutic exercises.

The book is divided into two parts, the first section has to do with Massage, the second takes up Therapeutic Exercise. Chapter one describes the technique of the various forms of manipulations used, in language that is simple and clear. Illustrations from actual photographs and a schematic drawing of the dorsal musculature greatly assist in understanding how the hands and fingers of the manipulator should be placed and the direction in which pressure should be made. From the five fundamental procedures she indicates many variations which coupled with movements to joints produces certain definite physiologic objects.

Some of the effects attributed to massage are listed:

(1) The skin and its structures are nourished.

(2) The venous and lymphatic flows are increased, thereby waste products are more easily eliminated.

(3) Nerves are either stimulated or soothed.

(4) Internal congestion may be relieved by attracting blood from the deeper tissues.

(5) Adhesions may be prevented or removed.

(6) Reabsorption hastened, thickened tissues frequently reduced.

In chapter four she cites six golden rules for massage. Succeeding chapters describe the mechanics of massage to special parts for specific conditions.

Three chapters are devoted to functional and nervous disorders. It is disappointing to find only a few pages covering the functional disturbances; however, she describes in some detail the Weir Mitchell treatment in a previous chapter.

Two chapters on the treatment of recent injuries by early massage are well illustrated by drawings and Roentgenograms.

Part Two opens with a history of the development of therapeutic exercise in which she shows the subject to be broader in its scope than is generally recognized.

Five fundamental positions in Swedish Gymnastics are described as well as many combinations. Again we find excellent photographs and drawings assist us in grasping the author's directions. She particularly emphasizes foot weakness and spinal curvature and gives lists of exercises for the treatment of each condition. Cardio-vascular and paralytic disorders also receive attention.

An appendix gives the minimum requirements in equipping a gymnasium and the electro-therapy outfit.

The book should be of value to hospital physicians and nurses, not only for reference but as a stimulus to promote more and better work along the lines of massage and therapeutic exercise for ward patients.

GRAY.

Bacteriology for Nurses. By MARY E. MORSE, M. D., Formerly Pathologist to the Boston State Hospital, and MARTIN FROBISCHER, Jr., Sc. D., Associate in Bacteriology, Johns Hopkins Medical School. Third Edition, 12 mo. of 304 Pages with 57 Illustrations. W. B. Saunders Company, 1928. Cloth, $2.25 net.

A new edition of this exceedingly comprehensive book is welcome. We find that hand in hand with our increase in knowledge of the causation, prevention and treatment of disease, goes a more thorough understanding of

the subject of bacteriology, and therefore, books on this subject must be brought up to date at frequent intervals.

The arrangement of the subject matter of this volume seems particularly satisfactory. Section one is on General Bacteriology and is made up of ten chapters. Necessary information concerning cells, tissue formation and blood, first receive attention, following which comes a description of the general types of bacteria, their functions and pathogenesis, methods of growth, staining qualities, and their destruction by various disinfecting agents. This is succeeded by chapters on immunity, transmission of diseases, and general sanitation to prevent the spread of the same by bacterial contamination. Section 2 is devoted to a description of special forms of bacteria, and each chapter deals with a definite and distinct group. Not only are the organisms themselves described, but the diagnosis, transmission and treatment, from a bacteriological standpoint of the conditions or diseases due to them are instructively set forth. The fourteen chapters which comprise this section are filled with information which the nurse should find sufficiently exhaustive for all her needs, yet, it is given in a readily understandable and non-technical manner. A chapter is devoted to filterable viruses, a second to insect-borne diseases, still another to protozoal diseases, and the final chapter of the section to yeast and moulds. In section 3, the prevention of disease, and bacteriology from a public health aspect, are considered at greater length. Special diseases, such as tuberculosis, the typhoid group, diphtheria, measles, malaria and venereal diseases, receive consideration in separate chapters. The spread of knowledge concerning infection, prevention and treatment from an individual and from a community standpoint is particularly stressed, and in the final chapter it is stated in a clear, concise and emphatic manner, that acute communicable diseases are not individual but public health problems.

An appendix contains three parts, the first of which is an outline of the methods of collecting various specimens for examination, and the taking of cultures; the second part is made up of a group of suggested experiments and demonstrations for use by an instructor and class, while part three is a Glossary. There is also a very good index.

The illustrations, of which there are fifty-seven, are carefully selected and are not those so frequently seen in similar works. The authors have pictured most of the bacteria under the same magnification, which seems a particularly satisfactory method, as it gives the student an opportunity for visual comparison not usually available. The work as a whole is a distinct credit to the authors, and this new and enlarged third edition unquestionably maintains the high standard set by preceding ones.

PRITCHARD.

The Principles and Practice of Nursing. By BERTHA HARMER, R. N., B. S., A. M. Second Edition, Revised, 738 Pages, Illustrated. The Macmillan Company, New York, 1928. Price $3.00.

The first edition of this book is so generally known and so greatly appreciated and approved that review or comment regarding the present edition seems almost unnecessary. The book is divided into awo parts: Part One, the foundation of nursing and elementary nursing, and Part Two, nursing in the prevention and cure of disease, and nursing the acutely ill. The second part is separated into three main divisions, the nursing care and treatments used in medical diseases, in surgical diseases, and in diseases of the eye, ear, nose and throat.

Several chapters have been entirely rewritten, new drawings and illustrations have been provided and the author's presentation of such topics as communicable diseases, diabetes, anaemia, vitamines in feeding, heliotherapy, etc., has been thoroughly revised and brought up to date.

The plan of the book follows logically from the simple to the more complicated nursing procedures and admirably correlates theory and practice. The author has succeeded in making a technical work surprisingly interesting, a feature which should commend it in particular to the student nurse. And a work which is of interest to the student and which possesses so admirable an arrangement of subject matter cannot fail to be of material assistance to the teacher.

If the previous edition met the approval of superintendents of schools of nursing and similar institutions throughout the country, as is shown by the fact that many adopted it as a text, this revised second edition is surely worthy of even a wider recognition as a publication of genuine value to training schools and the nursing profession.

TADDIKEN.

Primary Studies for Nurses; a Textbook for First Year Pupil Nurses. By CHARLOTTE A. AIKENS, Formerly Director of Sibley Memorial Hospital, Washington, D. C. Sixth Edition, Thoroughly Revised. 12 mo. of 572 Pages, 139 Illustrations. W. B. Saunders Company, Philadelphia. Cloth, $3.25.

The author is too well known to require an introduction and it would seem almost unnecessary to review this, the latest edition. The mere fact that she has revised the book and brought it up to date should be sufficient recommendation.

The entire book has been thoroughly revised, many new illustrations added, important additions have also been made to the chapter on applied anatomy and to the section on materia medica.

This is a compilation of the essentials required by first year pupils in a nurses' training school and covers courses of studies in Anatomy, Physiology, Chemistry, Hygiene, Bacteriology, Materia Medica, Dietetics and Invalid Cookery.

The author's purpose is to assist in securing graded instruction in training schools, to promote uniformity in the teaching of the subjects allied to nursing, and to show the way to avoid waste of time for teachers and pupils in preparing for the ground work of theory. It is designed to be midway between a book of reference and a textbook of practical nursing. How successful the author has been in developing her goal is evidenced by the number of editions through which the book has run and by the large number of schools recommending its use in their curriculum.

The author has very sensibly presented, in each section, the things a nurse should know to intelligently assist the physician in the care of the sick. She has intentionally omitted much of the technical detail required by the practitioner which is so often included in other nursing textbooks and which tends to overload the student nurse.

Each page shows great care in its arrangement, there is no indulgence in prolixity. Each subject is dealt with in a concise, common sense manner, very convincing, clear and practical.

In the introduction some splendid suggestions are made to the teaching corps, a list of practical duties and general essentials is given, as well as the recommendations of the American Hospital Association for first year students in clinics and demonstrations; and finally a list of books suitable for the beginner is appended.

The first eight sections of 500 pages considers anatomy and physiology, chemistry, etc., leading up to dietetics and invalid cookery. The final section is devoted to a series of 600 review questions of value to the older student who is preparing for the State Board or for the young woman testing her retentive capacity.

In the appendix are found tables for cooking, weights and solutions, household antidotes and a glossary of medical terms.

The value of certain sections is enhanced by many excellent illustrations, some in color, others schematic. Blank pages for notes are found at convenient intervals. A general and a special drug index completes a well-rounded volume almost in itself sufficient for the first stage in nursing education.

GRAY.

Suicide. By RUTH SHONLE CAVAN, Ph. D., University of Chicago, Sociological Series. Published by University of Chicago Press, Chicago, Ill.

Most studies of suicide have originated in a statistical point of view, and have attempted to establish correlations between the frequency of suicides and such factors as climate, season, race, fluctuations in business conditions, etc. Such correlations, even when established, do not in themselves indicate causation and may easily be represented as mere concomitants. It is necessary, therefore, to pursue the analysis and to search out factors of a personal or social nature.

The main emphasis in this volume is, therefore, psychological. The author seeks for the impelling motives toward suicide in disintegration of a personal or social nature. The analysis begins with a distinction between two broad types of suicide—one which is socially recognized and another which is frowned upon by society. Examples of the former are suicide by hari kari and the Indian custom of suttee. In these cases, it may be said that suicide has become institutionalized. Other examples are those of religious martyrs, or sea captains who go down with a sinking ship. The second class of suicide, and the one which forms the subject matter of the volume is the individualized type which results from personal disorganization following individual crises.

The personal disorganization may be due to general dissatisfaction with life without a specially identified craving or it may be due to a recognized wish or specific event. Examples may be seen in dissatisfaction arising from lonesomeness and want of a female companion. In other cases it is an unsatisfied desire for a specific female companion. A suicide may result from mental conflicts or a generally broken life organization.

The traits or acts ending in suicide are analyzed psychologically as follows: An interest becomes dominant as in a desire to avoid pain, or to continue a past routine. This is followed by a fixation of the idea and finally by a lack of objectivity.

The data upon which the above analysis was based were secured from two sources. One consisted of diaries left by persons committing suicide, and case histories drawn up by certain social agencies in Chicago; the other dealt with a questionnaire submitted to college students in which they were asked to identify and comment upon incipient wishes directed toward suicide. Against the data gathered from these sources may be raised the objection that they may not be truly representative of all suicides or of all social classes. For example, the Chicago cases represent economic failures—otherwise it is not clear why they came to the attention of relief agencies. Consquently the one factor present may be conceived of as the broken life organization resulting from poverty. Is such a sample representative of

individuals who commit suicide only because of disappointment in love, for example? A similar overstressing of one factor may be suspected in the case of college students who also represent a social selection, not typical of the entire nation. These suggestions of a possibility of inadequacy in the sampling of the data should not detract, however, from the merits of the subsequent analysis, nor from the great credit due for the painstaking search after dynamic factors.

In addition to the psychological point of view, the volume presents the usual statistical analysis. It cannot be said that this is on as high a plane as the remainder of the volume. The analysis is rather elementary and incomplete. The graphical representations could be greatly improved upon. The serious defects from a statistical point of view are found, however, in the analysis of the suicide rate in Chicago. The city was divided into a number of districts, each of which was subsequently rated as to the presence of lodging houses, pawnshops, the number of divorces, murders and deaths from alcohol and drugs. It was then shown in a manner more literary than statistical, that districts with high suicide rates appear to have high frequencies of the above conditions. The conclusion was drawn that suicide is therefore a concomitant of a disorganized community. No exception can be taken to the conclusion, as such, but it is evident that each of the above factors is capable of being represented statistically and it was, therefore, possible to make a thorough analysis by the method of correlation and to draw rigorous conclusions.

There are interesting statistical suggestions to the effect that race and religion are not correlated with suicide. The former is seen from the fact that the same race shows different tendencies in different places and at different times (e. g., compare suicide in Denmark and Sweden). With respect to religion the author shows that suicide rates among Jews and Catholics are steadily increasing. It is suggested that this may be due to a decline in the intensity of religious belief and that church affiliation tends to become merely a formal gesture.

Enough has been said to show that this volume is worthy of serious attention. It makes many a suggestion for future study.

MALZBERG.

Maternal Mortality and Stillbirths in New York State, 1915-1925. By J. V. DePorte, Ph. D., Director, Division of Vital Statistics, New York State Department of Health.

Among the marked contemporary achievements in the field of public health is the significant reduction in infant mortality. One would naturally expect therefore, to find a corresponding improvement in the case of maternal

mortality. Yet despite the efforts of physicians and public health officials, the death rate for maternal mortality remains almost constant. The above study presents detailed statistics for 1915-1925 inclusive, for the State of New York, exclusive of New York City; an analysis of the periods 1915-1920 (exclusive of 1918, the year of the influenza epidemic) and 1921-1925 shows exactly the same rate, namely, 56.8 maternal deaths from all puerperal causes per 10,000 total births. The fact that these rates are not only stationary but much higher than those found in England and Wales, Denmark and the Netherlands leads to an inquiry as to the reasons for such high rates, and the possibility of reduction.

Despite the elaborateness of the analysis it cannot be said that both problems were treated with equal success. It is suggested that an important factor in maternal mortality is interference with processes of labor by the obstetrician in his efforts to hasten delivery. However, it has been commonly held that in shortening the period of labor the obstetrician relieved the mother of dangerous strains upon other organs and thus saved her from future breakdown. This surely is a question worthy of statistical research and it is surprising that the report deals so largely with opinion upon this point rather than with verified fact. More encouraging for prevention is the extension of ante-natal and post-natal care.

The report omits comparisons between social classes. It is to be hoped that this may be undertaken in a future study for the reason that it is very likely that there are differential rates in maternal mortality. How, for example, do the rates among negroes or foreign-born whites compare with those of the native whites? If the former are higher, as they probably are, do they not account for the higher rates found generally in the United States?

The following are among the important findings of Dr. DePorte's study: In the United States Registration Area in 1924, 5 states had lower rates and 26 higher rates than New York. As a cause of death among women aged 15 to 44, puerperal diseases were second only to tuberculosis and caused one out of every six deaths.

Maternal mortality increases with the age of the mother.

There is a correlation with the seasons of the year, the highest rates occurring in late winter and early spring, the lowest in late summer and early fall.

During the interval 1915-1925, mortality from puerperal septicemia declined 4 per cent, from puerperal albuminaria and convulsions, 14 per cent, whereas mortality from puerperal hemorrhage increased 14 per cent. Death rates from other puerperal causes remained practically the same.

MALZBERG.

Syphilis. By HENRY H. HAZEN, A. M., M. D. Second Edition. St. Louis. C. V. Mosby Co. 1928. Pp. 643. Price $10.

About eight years has elapsed since the first edition of Dr. Hazen's book appeared. In this edition considerable new matter appears and several chapters have been entirely recast. The bibliography, which is a useful feature of the book, has also been brought up to date. Though the author describes his book as a small one, it is really a comprehensive treatise in which all phases of syphilis are discussed with particular emphasis upon symptomatology and diagnosis.

Regarding the value of tryparsamide in neurosyphilis he says, "Tryparsamide has no effect upon cutaneous or visceral syphilis, but in some 30 per cent of all cases of late neurosyphilis including paresis, it has a marked good effect both clinically and serologically. It is probably more effective if given after a course of arsphenamine, and if accompanied by the use of mercury." He very properly emphasizes the dangers to be voided in the use of tryparsamide, one of which is, of course, damage to the optic nerve. He recommends that before beginning treatment the patient should have a thorough examination and test of the visual field by the perimeter, and that these examinations be frequently repeated during the course of the treatment. He has found that about 15 per cent of all cases treated with tryparsamide show some visual disturbance and that 3 per cent have shown serious and permanent damage. Any diminution of the visual field, as shown by the perimeter, is an imperative indication that the drug should no longer be used. He still speaks favorably of the intraspinal treatment originated by Swift-Ellis and describes the modifications suggested by Fordyce. "The indication for spinal therapy are optic atrophy in early cases of neurosyphilis which show a paretic curve, in cases of early or late neurosyphilis which does not show improvement under intravenous arsphenamine therapy, the majority of the early cases of tabes, and the late cases which show fluid findings indicating meningeal irritation, and in fulminating cases of neurosyphilis."

The author speaks hopefully of the results which may be anticipated in the intraspinal treatment of tabes and though he occasionally finds cases which do not respond to this or any other form of treatment, he has a number under observation where remissions have lasted for as long as ten years.

As to the malarial treatment of paresis, the author devotes but a paragraph. The best he can say in regard to it is the following: "While the results are apparently remarkable, it is wise to employ watchful waiting before accepting all of the claims."

As to the prevention of neurosyphilis he quotes Moore's figures which show that 2 per cent of women and 7 per cent of men develops paresis after

syphilitic infection and refers to various theories that have been offered to account for its different incidence in various countries and racial groups. The author himself makes no personal comment upon the probable truth of any of these theories but instead suggests that neurosyphilis can be prevented, or at least greatly lessened, by more thorough treatment of systematic syphilis and believes that four full courses of arsphenamine are necessary as a routine measure.

Dr. Hazen's style is clear and readable. The illustrations, of which there are 165, a number of them being colored, add to the value of the book.

HUTCHINGS.

ANNUAL MEETING OF THE AMERICAN OCCUPATIONAL THERAPY ASSOCIATION

The American Occupational Therapy Association held its annual meeting in San Francisco, August 6 to 10, 1928, in conjunction with the annual convention of the American Hospital Association.

The California State Occupational Association with true western hospitality, made arrangements for the entertainment of officers and members of the national organization at various functions both in Los Angeles and in San Francisco and, in addition, conferences on local matters pertaining to occupational therapy were arranged.

The American Hospital Association provided space for the exhibits of patients' work which were of an exceedingly fine character. The exhibits from various State hospitals of New York created unusual interest, due to the fact that so many of the projects were developed from waste material.

The sessions were presided over by Thomas H. Kidner, president. Miss Esther Hill, president of the California Occupational Therapy Association, delivered a spirited address of welcome to California.

Dr. Joseph C. Doane, president of the American Hospital Association, gave a helpful address pointing out the necessity of providing for this form of treatment in all hospitals and stressing the difference between mere occupation and therapeutic occupational activities.

In his presidential address, Mr. Kidner dwelt at length on the proposed national registration scheme for qualified occupational therapists, for which there has been a growing need for some years.

The joint report of the Board of Management and the secretary-treasurer made particular reference to the various calls for professional cooperation that have been responded to by the central office; including the surveys, which have been undertaken by Miss Mary Shanklin, of the national leprocanium at Carville, Louisiana for the United States Public Health Service, and of the "Half-Way House" for tuberculous patients at Colorado Springs, Colorado, etc.

A rising vote of thanks was tendered the secretary-treasurer, Mrs. Eleanor Clarke Slagle, for "her untiring efforts on behalf of occupationnal therapy in general for so many years".

At each session interesting and valuable papers were presented both by physicians and therapists. The afternoon session of Wednesday, August 8, held special interest for those who are or who have been associates in the work of the Veterans' Bureau Hospitals, the session being held at the U. S. Veterans' Hospital, Palo Alto, California.

On the invitation of President Kidner, Dr. B. W. Carr, chief of physiotherapy and occupational therapy, U. S. Veterans' Bureau, Washington, D. C., presided. Dr. P. G. Lasche, medical officer in charge of the hospital, welcomed the visitors most cordially.

A paper prepared jointly by Dr. Lasche and Dr. Harry Rubin, clinical director of the hospital, on "Occupational Therapy Management of Deteriorated Cases" was then presented.

This paper dwelt at length on the successful operation of the habit-training program that has been in operation in that hospital for some years, and Dr. Rubin concluded his paper with some extremely interesting case records.

During the discussion of the paper by Drs. Lasche and Rubin on "Occupational Therapy Management of Deteriorated Patients", Dr. Carr said that habit-training for deteriorated mental cases had been first brought to his attention by the remarkable results obtained by this form of treatment as developed by Mrs. Slagle in the New York State hospitals. Miss Madeline Downs told of the increasing success of the habit-training work at Kings Park and of the fine spirit of cooperation with which it was made operable.

Among the features of the meeting deserving special mention was the rare hospitality of Mrs. Eastman and Mrs. Shilling who generously invited the members of the Association to visit their magnificant estates; an evening in Chinatown which included a special performance in the Mandarin Theater of a Chinese allegorical play, a visit to various Chinese social institutions, including a hospital. A troop of Chinese Boy Scouts acted efficiently as guides for the evening.

At the business session of the Association the report of the nominating committee was unanimously accepted and the following officers and members of the board were elected for the coming year:

For President.....Dr. C. Floyd Haviland
For Vice-President.....Dr. B. W. Carr
For Secretary-Treasurer.....Mrs. Eleanor Clarke Slagle

BOARD OF MANAGEMENT

Retiring members reelected:

Dr. Joseph C. Doane,
Dr. Horatio M. Pollock,
Mrs. Frederick W. Rockwell,
Miss Kathryn H. Root.

New members elected:

Mr. T. B. Kidner (Vice, Dr. Haviland).
Miss Geraldine R. Lermit (Vice, Dr. Carr).

SUDDEN DEATH OF DR. NEVIN

Dr. E. A. Nevin, superintendent of the Newark State School, died suddenly October 10, 1928 at a Baltimore Hotel. With Mrs. Nevin, he was on his way to attend the general convention of the Protestant Episcopal Church in Washington. The cause of death was found to be a clot of blood on the brain.

Doctor Nevin was appointed to the superintendency of the Newark State School on December 17, 1909. For six years previous he was on the staff of the St. Lawrence State Hospital.

A review of Dr. Nevin's public service will be given in the next issue of THE QUARTERLY.

TIMOTHY E. McGARR

MR. McGARR COMPLETES FIFTY YEARS OF STATE SERVICE

Timothy E. McGarr, of Albany, treasurer for the State institutions in the Department of Mental Hygiene, and business manager of THE PSYCHIATRIC QUARTERLY, on September 30, 1928, completed fifty years of continuous State service, performed for the greater part of that time in the administration of the State hospitals for the insane. He entered the service of the State on September 30, 1878, at the State Lunatic Asylum, now the Utica State Hospital, as stenographer to Dr. John P. Gray, the foremost hospital superintendent of the country. When the first State Commission in Lunacy was organized Mr. McGarr was elected secretary. He served in this capacity for about 24 years or until July 8, 1913. For the succeeding eight years he was attached to the Commission's business department. On September 21, 1921, he was appointed treasurer for the State hospitals and since the reorganization of the State service in 1926, he has served as treasurer for the State institutions in the Department of Mental Hygiene. In discharging the duties of this position he disburses over twenty million dollars annually.

For over thirty years Mr. McGarr has been an outstanding figure in the official and social life of Albany. He is a member of the Fort Orange Club and of many other social and religious societies. He is an enthusiastic supporter of St. Vincent de Paul's Society, the Albany Community Chest and a liberal contributor to many other worthy causes. He is a skillful executive and possesses a wide knowledge of men and affairs. Though now in his 73rd year, he measures up with many much younger men.

Mr. McGarr received on October 1, in recognition of his fifty years' service, a watch, chain and knife from his associates in the Department of Mental Hygiene and other friends in hospital service. The presentation was made by Dr. Frederick W. Parsons, Commissioner of Mental Hygiene. In addition, Mr. McGarr was given a leather portfolio, suitably inscribed, which contains congratulatory messages from Governor Smith, Commissioner Parsons, former commissioners of the Department, superintendents of State hospitals and other friends and associates.

Mrs. McGarr shared in the honor bestowed upon her husband. She was invited to the watch presentation ceremony and to her, Commissioner Parsons presented a silver bowl and a bouquet of roses.

NOTES

—Dr. Arthur Pendleton Herring, commissioner of mental hygiene of Maryland, died May 29, 1928, at the relatively early age of 53. From the age of 21 when he took his degree in medicine at the Baltimore Medical College, until his death Dr. Herring devoted his energies to the teaching and practice of neurology and to the care of the mentally ill. The latter gave him an opportunity to display a genius for organization, for upon succeeding to the position of executive secretary of the Lunacy Commission of Maryland in 1909, he began a newspaper campaign exposing the deplorable condition of the insane, many of whom were confined in almshouses. The publicity resulted in the adoption of State care for the insane in Maryland.

In 1915 and 1916 Dr. Herring at the request of the National Committee for Mental Hygiene, surveyed the State hospitals of South Carolina and Louisiana. In 1917, he entered the army as major in the Medical Reserve Corps. He was appointed chief of the neuro-psychiatric section of U. S. General Hospital, No. 2, and maintained subsequent relations with the U. S. Veterans' service.

—An intensive course in child guidance consisting of lectures and clinical demonstrations was given by the Department of Mental Hygiene for physicians conducting State child guidance clinics, at the Medical Center, New York City, during the week beginning September 10, 1928. The program was arranged by Dr. Sanger Brown II, assistant commissioner of mental hygiene, and he presided throughout the various sessions. The lectures and demonstrations were given by specialists in children's diseases and in child guidance work. The course was attended by 44 physicians and social workers most of whom are employed by the institutions in the Department of Mental Hygiene.

—The Medical Center of New York City was formally dedicated October 12, 1928. The speakers at the exercises included Gen. William Barclay Parsons, chairman of the Joint Administrative Board, Dr. Nicholas Murray Butler, president of Columbia University, and Dr. Samuel W. Lambert, dean emeritus of the College of Physicians and Surgeons.

The Medical Center comprises the Neurological Institute, the Babies Hospital, the Presbyterian Hospital, the Sloan Hospital for Women, the Vanderbilt Clinic, the New York State Psychiatric Institute, and the College of Physicians and Surgeons. Following the exercises some of the buildings were opened to the public for inspection. Among them was the first floor of the Presbyterian Hospital, which is now in full operation.

—The September, 1928, issue of Hospital Social Service contains an interesting article on the activities of the Mental Aftercare Association of the United Kingdom. This Association founded in 1879, long prior to the days of the psychiatric social worker, maintains cottages for the care of patients discharged by hospitals and clinics. Trained men and women care for from four to eight patients in the cottage. No patient over 60 years of age is accepted as it is intended to make every discharged patient self-supporting. One cottage cares for elderly ladies who after 10 to 20 years of hospital life find themselves without friends or relatives and without sufficient means of support.

—The United States Civil Service Commission announces open competitive examinations for medical officers, graduate nurses and occupational therapists in the public health service, Veterans' Bureau, and similar departments. Interested individuals may obtain full details by writing to the United States Civil Service Commission at Washington, D. C. Applications will be received until December 29, 1928. The salaries are as follows: Senior medical officer, $4,600; medical officer, $3,800; associate medical officer, $3,200; assistant medical officer, $3,600; occupational therapy aid, $1,680 to $2,040; graduate nurse, $1,620 to $2,700.

—The League of Mental Hygiene of Sao Paulo, Brazil, has begun the publication of Archivos Paulistas de Hygiene Mental, official journal of the League, to be issued twice a year, in June and December. The June issue deals with problems of proper hospital care for voluntary mental patients, the prevention of suicide, selective immigration, infant care, and other mental hygiene subjects. Dr. A. C. Pacheco e Silva, Director of the Hospital de Juquery, is president of the Sao Paulo League, which is affiliated with the Brazilian League for Mental Hygiene.

—According to Hospital Social Service for September, 1928, the Herman M. Biggs Memorial Fund founded in honor of the late Commissioner of Health of the State of New York, has contributed over $55,000 to the New York University and Bellevue Medical College for the establishment of a professorship in preventive medicine in memory of Dr. Biggs.

—Dr. V. V. Anderson, who for several years was director of medical research of R. H. Macy & Company, has resigned his position in order to devote his entire time to the direction and further development of his mental hygiene school, "The Spruces," at Staatsburg-on-the-Hudson.

—Dr. Josephine V. Neal, who is connected with the Medical Center in New York City, is abroad consulting European authorities on epidemic encephalitis, prior to taking up research work in this field at the medical center.

—The Alienists Francais for April, 1928, reproduces a letter from the president of the Confederation of Intellectual Workers (section of Industrial Engineers) which raises the interesting question of the nature of certain mental maladies which attack some engineers after 15 to 20 years of service. This is alleged to result from a chronic state of intellectual overwork and worry. The writer raises the question, whether there are intellectual professions which provoke mental maladies and if so, whether they should not be recognized by law as professional (occupational) hazards.

—The Denver Chemical Manufacturing Company of New York City, publishers of the *Bloodless Phlebotomist*, dedicated a recent issue to the memory of the late Dr. Hideyo Noguchi. This issue (Volume VII, No. 11) is to be distributed to all English-speaking physicians, and will also be published in the near future in Spanish, French, German, Italian and Japanese. On the cover page is an interesting crayon drawing of Dr. Noguchi, a copy of which, in a size suitable for framing, will be mailed to anyone who will write to the publishers of the Phlebotomist.

—Pennsylvania citizens who are interested in the welfare of their institutions are carrying on a campaign in behalf of a bond issue of $50,000,000 to develop and improve the institutions for the insane, feebleminded, epileptic and delinquents. A Citizen's Committee for the Welfare Bond Issue has recently issued an attractive pamphlet setting forth the present crowded condition of the State institutions and pointing out the improvements necessary in order to enable these institutions to fulfill their purposes.

—Erratum, Vol. 3, July, p. 316, line 30, should read: "The indicator is prepared as follows: Dissolve 0.1 gm. of phenol red," etc.

A VICIOUS CIRCLE

and the proper point for its attack

IS CONSTIPATION a cause or an effect? This question is occupying much attention among physicians today, for constipation and all the symptoms surrounding it continue to occupy as large a place as ever in human life and in the doctor's daily practice.

"Constipation is like a headache," argues one authority, "simply a symptom of some underlying physical error or improper habit of personal hygiene." Worry, inadequate exercise, faulty eating habits, or the habitual use of laxative drugs —these are all influences which produce intestinal impairment.

But if constipation is an effect, it is also a cause. It often causes indigestion, heartburn, bad taste, acid eructations, suppurative diseases of the skin. Careful investigators have concluded that chronic cases of constipation almost invariably produce serious affections of the nervous system — irritability, headache, insomnia, melancholia and what perhaps might be termed *mental* stasis.

CAUSE and effect—action and reaction—a vicious circle. Somewhere the physician must step in and break it up. The authorities cited above point out that thorough investigation of the intestinal tract is essential. The treatment for constipation, they assert, is often all that is required to correct neurasthenic conditions—"A proper hygiene and therapy of the intestinal tract will often be the deciding factor in differential diagnosis."

For a laxative that does its work easily and naturally many physicians recommend fresh yeast.

Yeast has these advantages: It tends to soften the fecal masses and to increase their bulk and moisture. It diminishes putrefaction and gently stimulates the bowel muscle to perform its function—precisely opposite to the effect of cathartics.

WHILE investigation has shown, in the words of one authority, "that intestinal antiseptics diminish the ability of the intestine to destroy bacteria" the action of fresh yeast is just the contrary. Eaten daily in sufficient quantity, yeast combats the development of hostile types of bacteria in the intestine.

The action of yeast in increasing the number of white cells in the blood accounts for greater resistance and the well known efficiency of yeast in the treatment of acne, boils and other skin diseases.

Physicians usually suggest three cakes daily, one before each meal or between meals. Yeast may be eaten just plain or suspended in milk or water—hot or cold—or any other way the patient prefers. For constipation it is most effective when dissolved in hot (not scalding) water, one cake before each meal and at bedtime.

A copy of the latest brochure on yeast therapy containing a bibliography of articles and references on the subject will gladly be mailed on your request. The Fleischmann Company, Dept. 327, 701 Washington St., New York City.

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